



FRIDAY, MAY 10, 1895.

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Contributions.

The United Verde & Pacific Railway.

PHILADELPHIA, May 4, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Apparently the argument that had the most weight in deciding the gage of the United Verde & Pacific Railway was the estimate that a standard gage would cost 80 per cent. more than a narrow gage. It is evident that the crucial question in such an estimate is what to assume as the sharpest curve that can be safely operated on a standard gage road, as if the same curves can be used on both gages, the difference in the cost of construction will be insignificant.

In Wellington's "Economic Theory of Railway Location" there is cited a case where a curve of 136 ft. radius was used on a Y for standard gage, consolidation engines, and the Philadelphia & Reading in Philadelphia ran switching engines with a rigid wheel base of 10 ft. on curves of 90 ft. radius.

As there appears to be no reason why a standard gage mogul could not be built with the same weight, hauling capacity and rigid wheel base as was built for the narrow gage, what was there to prevent the above road from being operated as a standard gage on the same alignment that it was built on as a narrow gage?

ENGINEER.

The Strains on Draft Rigging.

PHILADELPHIA, April 27, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

As the correspondent whose inquiry formed the text for your editorial, in your issue of April 19, on the permissible strain in draft rigging, I would like to add a few words thereto.

The subject is certainly one that should engage the attention of railroad managers, for it now appears to be the real limiting factor in fixing the train load.

It may not be generally appreciated that the same locomotive, if fully loaded, will exert a greater tension behind the tender on light grades than on heavy ones. This is doubtless the reason why the heaviest locomotives are not used on light grades, where they could, if it were not for the weakness of the draft rigging, effect a considerable saving in train movement.

Inquiries made since first writing you, seem to indicate that the maximum tractive force behind the tender that can be safely counted on at present is from 20,000 lbs. for the most unfavorable circumstances, such as would be caused by badly undulating grades to something under 40,000 lbs. for the most favorable. On one of the most progressive of the great trunk lines, which probably hauls as heavy trains as it finds to be safe, it is only about 22,000 lbs., and the greatest actual strain I have found is about 36,500 lbs., in a case where the trains are run at a very slow speed, and which also happens to be one where the locomotives are not loaded to their full capacity on account of the risk of breaking the trains in two.

I hope we shall hear from some of the M. C. B.'s on this subject. JOHN MARSTON, JR.

Rigid Track.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It is current belief that the only safe and pleasant track is elastic. Is this belief correct, and on what is it founded?

I have been driven many times to declare that there is no such thing as theory about a railroad track, and that our track experience is so new, that the list of well observed facts is so short, and that the changes in conditions as to ballast, surfacing, weight of rail and of rolling stock are so rapid that we really have had no time or opportunity to form theories.

So let us assume that there is no theory in our way, and prove a fact before trying to account for it. We have been used to saying that an anvil must be rigid to do good work under a blow, hence a track must not be rigid or it would be an anvil. If we can keep the blow away from an anvil it could as well be on springs. If we can keep the blow away from our track, or keep it from assuming a destructive form, may it not be true that a rigid foundation is the best?

If the rolling mills would give us a decent rail as to surface (which they will not) it would seem that we could, by providing a perfectly rigid foundation, have a uniform support for our rails, and avoid the blow except at the rail ends.

When this blow at the joint is not too severe, we know that rails have stood it for years. I have seen rails 20 years old with the ends showing as little wear as the centers. I expect to hear people say that these rails had an elastic support at the ends, and this will be true for six or seven months, in each year, but not true for five or six months, and the summer and winter blows were probably much more severe owing to the elastic and yielding foundation, than they would have been on a smooth and rigid foundation.

In our northern climate we have a rigid foundation for five or six months; has any one noticed that rails wear more rapidly during this time when the foundation is level and smooth? It is no answer to this question to say that rails wear more rapidly on stone ballast than on gravel—stone ballast gives us neither a smooth or rigid roadbed—and the rails as now supplied by our mills are so lumpy that we would expect poor results on stone ballast.

If we want a good running stationary engine, we provide as solid a foundation as possible, and a rigid frame. Here, of course, the motion is smooth, but is it not about time we looked a little after providing a smooth track for smooth wheels? An unknown writer says: "The rapid passing of heavy trains over unresisting surfaces, produces a vibration disastrous to both engine and car." Now does it? Ties act as piers, and these on elastic foundations are apt to settle unevenly, and this added to the handicap given us by the rolling mills, insures a blow as from a hammer from each wheel.

Now, if we hammer a rail and hammer it hard enough and often enough, there is going to be trouble to the rail, or to the hammer, but we do hammer a rail for five or six months each year, much more severely on our uneven, frozen elastic (?) foundation, than we would in 12 months on a smooth, even, rigid foundation.

Some experience I have had in laying tracks for electric railroads has convinced me that it is time engineers took up this question in earnest. It is an immensely important question even if it effects only electric roads. If a rigid track is good for an electric road, why not for a steam road? The tracks of electric roads and cable roads cost much more per mile than those of any steam road. We must, of course, expect to do as the electric roads do on their expensive tracks; that is, hold our rails down. This we could do on a roadbed, giving a constant support instead of an infrequent one.

What goes up must come down, and under a rapidly moving locomotive wheel it comes down with a bang, and we find our elasticity in the wrong place and helping to tear our roadbed to pieces and pump wind under the ties. Any good trackman will tell us, as I was told years ago by the late Charles Collins, "Still track is the best."

The tracks of the cable and electric roads as laid in our city pavements are to-day the only tracks we have that have no up and down motion. If these roads are having good success with their tracks laid in concrete, is it not possible steam roads can profit by their experience? Will it require any more nerve to try the experiment of laying a steam road on concrete, having the experience of these roads as a guide than if did for those roads to use a rigid foundation with no experience to guide them?

J. D. H.

The New Freight Cars of the Boston & Maine.

We noted last week that the Boston & Maine Railroad is asking bids for 600 freight cars. The note, by the way, got classified by the printer under Locomotive Building. Since making that note we have received specifications from which we give a few particulars.

Of the 600 cars to be built 200 are box cars, 200 platform cars and 200 coal cars, and they are all of 60,000 lbs. capacity. All have the Fox, pressed-steel truck, M. C. B. axles, with $4\frac{1}{4} \times 8$ in. journals; wheel seat, 5% in.; axles at center, 4% in.; extreme length of axle, 7 ft. $\frac{1}{4}$ in.; hand brakes, National hollow brake beams. They have also the Gould, M. C. B., coupler, with wrought-iron pocket, the uncoupling device being the pin lifter and attachment standard on the Boston & Maine. The draw-springs are double coil of 22,000 lbs. capacity, outside coil of $1\frac{1}{2}$ -in. steel, inside coil of $\frac{3}{4}$ in.

The box cars are to be 34 ft. 5% in. long over end sills and 8 ft. 10% in. wide over side sills. The platform cars are 34 ft. long and 8 ft. 6 in. wide over sills. The coal cars are to be 30 ft. long and 8 ft. wide.

The framing is to be Southern pine and white oak as specified for the various parts; that is, the six longitudinal sills, the side plates and girths, the end girths and saddles are to be Southern pine, also the flooring. The end sills and other parts of the frames not specified above are to be of white oak. The inside sheathing is spruce and the siding North Carolina pine.

The box cars are to have the Winslow roof on 100 and the Drake & Weir roof on the other hundred. The doors

are to be hung with Acme hangers and to have Acme seal locks. The wheels for all of these cars are to be M. C. B. standard, made by the Swett Car Wheel & Foundry Co., of Chelsea, Mass. The journal-bearings are lead-lined, to be furnished by the railroad company. The box lids are pressed steel, top hinge. The cars are to be painted with the Sherwin-Williams Co.'s paint No. 1,732 and mortises and tenons are to be thickly painted with lead or fernoline. The tops of sills and other places where wood comes upon wood or wood upon iron are to be coated with lead or fernoline. The railroad company reserves the right to have an inspector to examine the work, with authority to reject material or parts not in accordance with the specifications and blue-prints. The material of no manufacturer is expressly specified except as noted above.

The Train Staff Quicker Than Train Orders.

At the April meeting of the Western Railway Club at Chicago, the principal business was the discussion on Mr. Goodnow's paper on the Train Staff, which was read at the previous meeting. (See *Railroad Gazette*, April 12, p. 232.)

Mr. F. A. DELANO (C., B. & Q.): I saw something of the electric train staff in England last summer, and was much impressed with the great improvement it was on the old train staff. If the electric train staff had been in use in England in the past, in all probability the English lines would not have found it necessary to double-track 90 per cent. of their entire railways. They tell ludicrous stories about how a messenger would have to walk the entire length of a block in order to bring the staff back which the train had carried to the other end of the block. Now with this Webb-Thompson system, as Mr. Goodnow has explained it, it is possible to dispatch an indefinite number of trains (according to the number of staffs or tablets which you may have provided) in one direction, and as long as the number of staffs holds out you can continue dispatching, eastward or westward, as the case may be, without having subsequent trains bring back the staffs. I would like to hear from Mr. Goodnow as to the applicability of this system on long lines. . . . With the train staff, trains must come nearly to a stop at every block station, or else they must be provided with some arrangement for taking and leaving the staff at speed. That has been done in England on some important trains, but the expense is pretty heavy. Here, stock trains are given an order at a division point, and they frequently do not get another order until they get to the next division point; but if a dispatcher wanted to run a train in that way by the staff system, it would be absolutely necessary to reduce speed and change staffs at each block station, involving in the aggregate a serious delay.

Mr. C. A. GOODNOW (C., M. & St. P.): There is no question but what the train staff is adaptable to any stretch of single track line. The only question is the cost. The present cost of each machine is about \$200, and it requires two machines at each station. A train dispatcher handling a line equipped with the train staff would have a control which under the present system he cannot have. Instead of being harassed and perhaps pushed by the necessary orders, the mere transmission of which is a considerable physical effort, he would direct the train movement by simply telling operators what they were to do, and in case of trains which he desired to give the preference he would simply say, "let 74," or whatever the number might be, proceed." Undoubtedly a code covering the briefest language necessary would soon be devised. If the dispatcher made an error in saying what train should go forward, or the operator misunderstood him, no collision could occur because if there was a train in the block it would be impossible to withdraw the staff for the waiting train. It seems to me perfectly practicable to work the staff system on any single track, and I think, so far as the facility and ease of working is concerned, the staff system is preferable to the present American system of train dispatching. The cost of the staff system will undoubtedly bar it from general adoption, but its adaptability cannot, in my mind be questioned. If the cost can be so reduced that the railroads can afford to adopt it we shall have something that is not only reliable but that will aid the movement of trains and thereby greatly increase the capacity of the line. The Chesapeake & Ohio has adopted the train staff on a piece of single track $2\frac{1}{4}$ miles long which includes a tunnel. Towers have been erected at each end of the section and the staff instrument interlocks with a semaphore signal. The staff itself is hung on an apparatus similar to a mail catcher and a train running 30 miles an hour, or thereabouts, picks it up and drops it at the other end of the section in the same manner. The semaphore signal indicates to the engineer of the approaching train whether he is to proceed or not, and so far away that it is possible for him so to handle his train that it will be stopped at the proper point, if it is not proper for him to proceed. There is one more feature; all the switches in the section would be locked with the staff and an engineer starting from a station would know positively that all the switches over which he had to pass were absolutely locked in the proper position. Every train dispatcher knows how slow the present system of train dispatching is. I think a fair average would be three minutes per order. With the train staff system it only takes a few seconds to change the meeting points of trains—five seconds probably at the outside. It would probably take, with our

code system, from five to eight minutes to make orders void or change meeting points under similar conditions.

The Chesapeake & Ohio people are delivering staffs at 30 miles an hour, and I do not think any of us would care to have our fast stock trains pass through the stations at a speed exceeding 30 miles an hour, unless the switches were interlocked and the station protected by distant signals. The apparatus used for delivering and receiving the staff is not expensive.

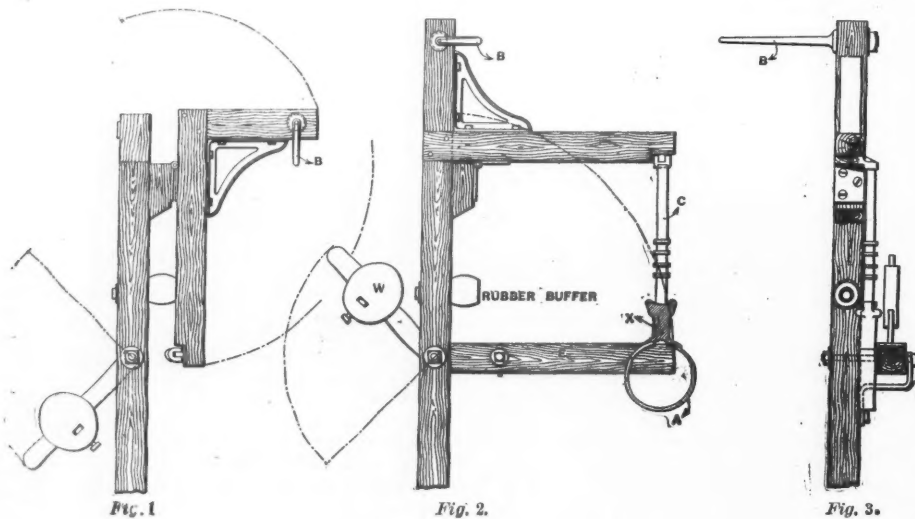
The Chesapeake & Ohio Staff Crane.

The engravings presented herewith illustrate a crane recently made by the Johnson Railroad Signal Co., for use at the stations on the Chesapeake & Ohio where the train staff is employed. With this crane a staff can be taken up by the engineman without slackening speed. After the signalman has set his signal at clear he takes the staff, C, from the machine and fixes it on the ring A, a suitable casting, X, being provided to keep the staff in the right position. When the engineman takes the staff the arm E assumes a vertical position, being pulled up by

pay for and the amount which it is possible for them to load in the cars set before them:

Articles.	Minimum required by classification.	Largest possible load, 34-ft. car.
	Lbs.	Lbs.
Baled hair.....	20,000	10,750
Empty barrels.....	20,000	10,800
Empty beer barrels.....	20,000	22,300
Church organ.....	24,000	10,000
Machinery.....	24,000	12,000
Chairs.....	16,000	4,500
110 bbls. potatoes.....	24,000	20,800
Commercial furniture.....	12,000	11,000
Hay.....	20,000	21,000
Glassware.....	16,000	12,000 to 14,000
Wool.....	10,000	7,000 to 10,000
Household goods.....	12,000	6,000 to 12,000
Spring beds.....	16,000	12,000
Oil stoves and ovens.....	24,000	8,000
Buggies.....	20,000	5,000
Desks.....	12,000	8,000
Tin fruit cans.....	20,000	4,000
Mattresses.....	16,000	5,000
Bed springs.....	16,000	5,000
Broom corn.....	14,000	8,000
Live stock (sheep).....	14,000	10,000 to 12,000
Poultry (live).....	16,000	10,000 to 14,000

It will be seen from this that the minimum classification on some articles is at least 50 per cent. [More than 100 per cent.—EDITOR] higher than the bulk capacity of



Crane for Train Staff—Chesapeake & Ohio Railway.

weight W, and the upper arm falls to the position shown in Fig. 1. The curved hook shown at B is to receive the staff when delivered by the engineman. As the locomotive passes the crane he holds the staff and ring in such a position that the ring, A, is caught by the hook.

Freight Classification and Furniture Cars.

BY S. H. CHURCH, PENNSYLVANIA LINES.

Any man who thinks that this Association has accomplished its work and that it may now devote its meetings wholly to social and excursion pleasures, is ignorant of a great many grievous abuses. You have done much to secure uniformity in office methods and official reports; you have introduced a spirit of cordial good fellowship; you have learned to haul down the black flag of piracy and to treat foreign cars as the property of a friend; you have fostered a spirit of fair play among those who handle cars, so that when some road with a big business and a small equipment starts out to ply the trade of Captain Kidd, the rest stand to their guns and promptly send out a broadside of indignation and reproach. But you have only begun your work. The field of action grows larger with each year. Problems become more serious; and the dignity of the Car Accountant's position grows with his efficiency. One of the most important questions of to-day is that of furniture cars, which has disturbed the transportation department of all roads.

The first furniture cars were built less than ten years ago. In 1887, following the adoption of the Interstate Commerce law, the classification of freight west of Chicago for points on the Pacific Coast was so altered as to make it impossible to load the minimum weight in the ordinary 28 ft. and 34 ft. cars. It was not long, therefore, until every shipper who had freight for the far west insisted upon having furniture cars, in order to enable him to load up to the minimum weight. This bad practice has continued to spread until now, when furniture cars are specified for almost every load of freight that goes out of competitive territory. The demand for these cars is so large that it is extremely difficult to fill the orders promptly, and over half the cars so supplied are hauled to the point of shipment empty. This is an expensive incident, and it is seldom that the cars arrive until some days after they are really wanted. As long as the use of these cars was confined to furniture, or even to furniture and carriages, it was not a hardship to provide them; but now they are ordered for almost everything, and shippers will use nothing else when they see there is any chance for getting furniture cars. The reason of this is found in our imperfect and inconsistent classification. For instance, the stove makers at a certain point would use no other kind of cars, and it was found upon inquiry that the minimum on stoves in 34-ft. cars was 24,000 lbs., while only 9,000 lbs. could be loaded.

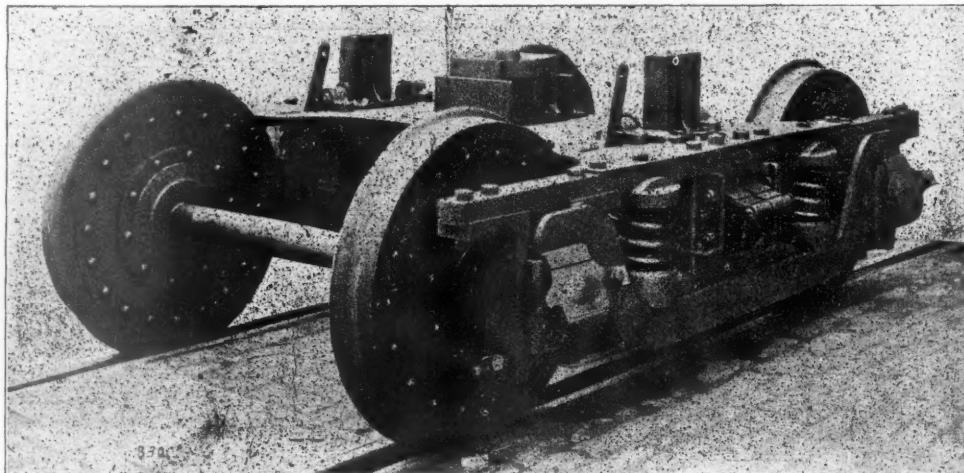
Is it not a source of some wonder that the railroads have put themselves into a position of giving the shipper a car which will not hold more than 9,000 lbs. of stoves and yet compel him to pay for 24,000? Yet this seems to be a fact, not only with regard to stoves, but to a hundred other commodities. Here is a statement showing some of the articles which have actually been shipped. Each item contains the minimum required by the classification and the largest weight that can be loaded in an ordinary 34-ft. car. You will observe large discrepancies between the amount which the shippers are required to

the cars. But there is nothing here to show that furniture cars would be necessary if we had a just classification. The furniture cars which many roads are adding to their equipment will demoralize the question of car supply; and as long as this classification is permitted to exist there will be such a demand at all points for furniture cars for local shipments that the dissatisfaction of those who fail to obtain them will outweigh any advantage that may be looked for in building them. If no change is made it will be necessary to build more furniture cars, and they will make the 34 ft. cars obsolete just as the 34-ft. cars did the 28-ft. cars.

Truck for Electric Motors—N. Y., N. H. & H.

We give an engraving from a photograph of one of the motor trucks now being built for the Nantasket Beach branch of the New York, New Haven & Hartford, by the Baldwin Locomotive Works.

The truck is very heavily built, having wrought iron side frames with loose pedestals bolted in position, and intermediate braces as well. The journal boxes are of cast-iron with heavy brasses neatly fitted to prevent



Electric Motor Truck—New York, New Haven & Hartford Railroad.

variation in axle centers. The center plates and cross-ties are made of steel and form the receptacle for the swinging bolster, which is also of steel. The bolster springs are double elliptic, and in connection with them there are provided the coil springs common to passenger car trucks to transfer the load to the equalizing beams and thence to the journals.

All parts have been accurately fitted to gages and every piece is interchangeable.

Selection and Training of Employees.

This was the subject of a paper read before the St. Louis Superintendents' Association on April 15, by Mr. H. I. Miller, Division Superintendent of the Vandalia line.

Mr. Miller opened by referring to the fact that railroad companies had expended large sums in testing materials, while very little had been spent in selecting the right sort of stuff for the personnel. The best employees are young men whose families live along the line of the road. Above all things avoid tramp brakemen, tramp operators and tramps of every kind. Do not promote from wiper to fireman, and on up through two or three grades, before you find out whether a man can work simple problems in arithmetic. Mr. Miller had found lectures by Road Foremen, Chief Dispatchers and Trainmasters exceedingly valuable; such lectures, lasting four hours each, and attended by from 50 to 100 employees, were always highly appreciated. Superintendents do not realize the importance of developing their men. One Superintendent of the speaker's acquaintance had doubled his own efficiency by making this one of his principal lines of work. Continuing, Mr. Miller said:

Many railroads claim to be too poor to have the superintendence which is necessary for the training of men. They make clerks of the train master, of the road foreman, of the chief dispatcher, and of the engineer of maintenance of way. Many railroad officers who have never had the practical experience of road work in any of its branches do not understand the advantages of the *esprit de corps* of a good organization. They say organizations are too expensive; whereas, in fact, it is only the rich corporation that can afford to do without a very complete organization. By having well-trained, careful men in road and yard work, there is a saving in overtime, in fuel, in oil, in draw bars and draft rigging, in picking up old material that can be used again and scrap that can be made over or sold. These are some of the places where we may derive great benefit from selection and training. Carefully prepared and bulletined statements of individual performance, whether it be of pounds of coal per engine mile, or labor per mile of track maintenance bring the men all together in one common interest. This requires the intimate knowledge by the head of each department of every man in the department, and this cannot be accomplished if the head of the department is to be a clerk. For years it has been the practice of many railroads, and the custom still exists on some, of promoting through seniority. A great many railroads do this almost without knowing it. Nothing can be more injurious to the service than to promote some man to a responsible position because he has been in the service six months longer than a very much better man. Frequently the older man is one who is indifferent in many ways to the company's interests, whereas the younger man may be a close student of economy and able to save for the company each year more than the amount of his wages.

The successful plan of discipline is that which takes fully into consideration the individual. Mr. Miller's experience with the relief system of the Pennsylvania convinces him that the great value of that means of strengthening the bond between employer and employee is well settled.

Among other subjects discussed at this meeting were loading trains upon tonnage basis and placing responsibility for damage by accidents on foreign tracks where a trackage charge is paid. The superintendents of the roads interested in the National stock yards, at East St. Louis, are discussing a proposition to form a switching association.

The American Type of Locomotive in England.

The tendency abroad toward outside cylinders, parallel rods and bogie trucks for locomotives is well exhibited by the illustration, which shows a class of engine adopted on the London & South Western Railway. The design

was made in 1890 by Mr. W. Adams, Locomotive Superintendent, and there are now 20 of these engines at work. With the exception of the steam chests, which are placed inside the frames, the engine is American in fundamental features; it does not correspond with the latest American practice, but follows more nearly some of the older types. The general dimensions are given below.

The boiler has some special features. It is made en

† A paper read at the Car Accountants' Convention, San Francisco, April 16, 1895 (condensed).

tirely of steel, including the firebox; the steam pressure is 175 lbs. per square inch. It is said in *The Engineer*, to which we are indebted for the illustration, that the boiler is constructed "entirely of mild steel, free from silicon, sulphur and phosphorus," but, of course, this is not strictly true. In the firebox there is a brick arch; the tubes are of brass; all wheel centers are of cast steel. The tires are secured by a lip and set screws $1\frac{1}{2}$ in. in diameter. The axles are specified to have a tensile strength not less than 63,000 lbs. per square inch, nor more than 72,000 lbs. The driving springs are equalized as in American locomotives. The slide valves are of bronze and the pistons are of cast steel; the piston rod packing is the well-known United States Metallic Packing. The crossheads are of cast steel and the connecting rods are of wrought iron; the parallel rods have an "I" section and the crank pins are of wrought iron case hardened. The Adams' vortex blast-pipe is used for the exhaust pipe. The tender axles have outside journals $5\frac{1}{4}$ in. in diameter and 9 in. long, although the weight per journal is but 12,000 lbs.; this gives a good factor of safety in the axles. In this country a $4\frac{1}{4}$ -in. journal often carries this load. The ratio of strength of these journals is about as 2 to 1. The diameter of these axles in the center is $6\frac{1}{4}$ in. The diameter of the M. C. B. $4\frac{1}{4} \times 8$ is 4%. The ratio of the strength of the two at the

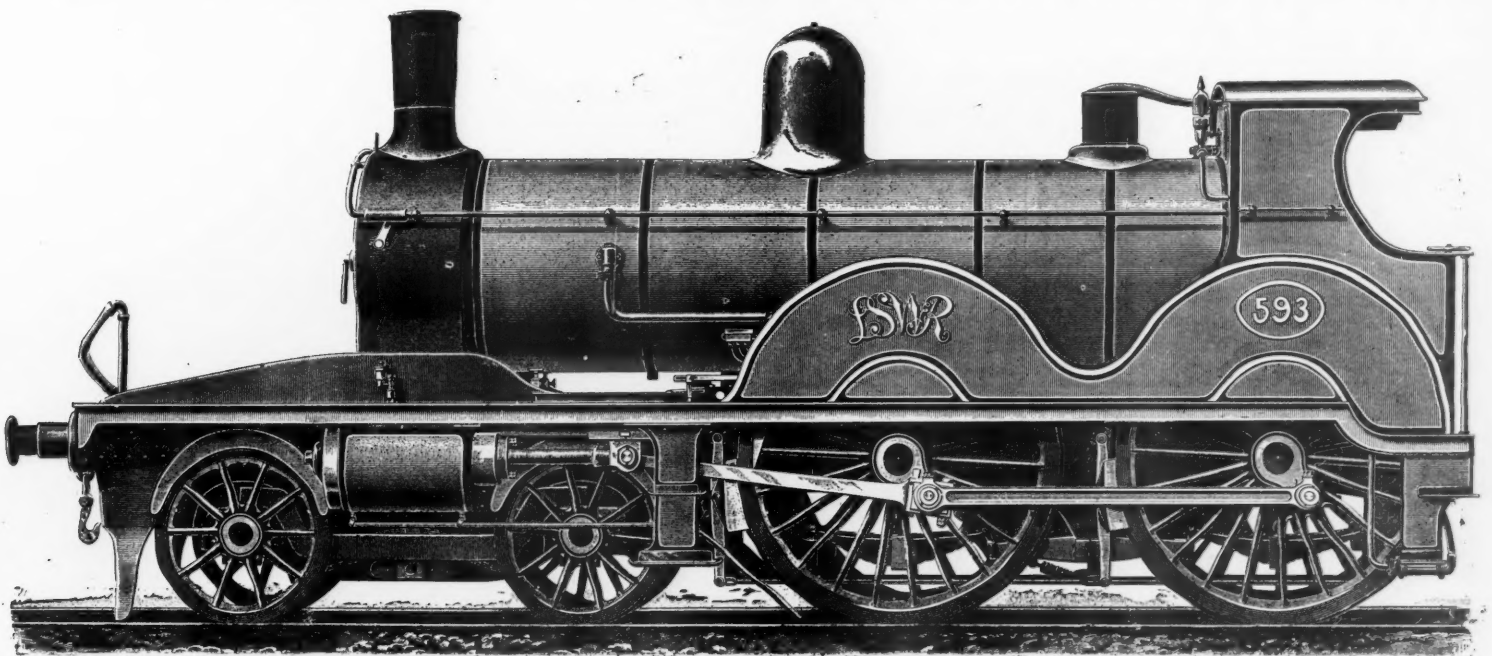
is outside the wheel. These figures represent the fiber stress for journal loads. The side figures show the total load on the axle journals, the load being at Z. For 25,000 lbs. on each journal, the fiber stresses would be about 14, 18, 20, 22, 26 thousand pounds per square inch, as shown by the several diagonal lines.

It is not considered safe, even where there is a steady load, on iron to pull more than 6,000 or 8,000 lbs. per square inch. Unless you are very sure you know all about the steel, it is not safe at over 10,000 or 12,000 lbs.; but where there is an oscillating reversing load it is not safe to go over 6,000 for steel, because if you do, the reversals of the strain will break it. The clearance in the type of an M. C. B. box is very small, and a slight inclination of $\frac{1}{8}$ in. in a foot, which is smaller than you can see, throws the bearings of the journal from the center either out or in, as the case may be, and a careful designer must always consider the maximum. A little rolling would throw it out or in. For the purpose of this discussion I will assume it to be half way between the center of the journal and the end, shown at the point Z. Therefore these journal loads were taken at that point. These heavy black lines are for the worst common condition, which is the stress at the center of the axle, and at the journal neck when a $4\frac{1}{4}$ -in. journal is worn down to $3\frac{3}{4}$ in. which is the limit. In order to read the diagram well, and to get to a point that we may discuss, we may take a furniture car weighing 40,000 lbs. The load is at C, which gives a fiber stress at the center of the axle of nearly 14,000 lbs., which is too high. They break in service, which shows that it is too high. When the journal is new for the same car it is 9,000 lbs., which is about right

when examined by the ordinary calculations in books. The theory of the strains on axles demands that they should be straight between wheels.

All we know about the theory of things is that when you calculate the stresses in the structure you must strengthen that part to correspond with the stresses. The strain between the wheels, as a simple calculation shows, at all points is exactly the same. If, for convenience in fitting, or for any other reason of practical consideration, it might be better to have the axle larger at the wheel fit, it might as well be so, but in any case there should be no point between those wheels where the axle is not strong enough to withstand the stress to which it is put. I think that it is more to the point to say that the theory on which this diagram of journal loads is made, which is assumed in books to be the true theory, shows axles to be correct when straight between wheels, because we do not know what the true theory is. All our theories are limited. But the limited theory demands that axles be straight between the wheels. There must be somebody here that has had broken axles, and it must be that axles do break sometimes when they are not hot or have a sharp fillet.

I would like to define my position with respect to this diagram. It has drawn out some things that are interesting. In the first place, the rolling of a car as it goes along a track is not continuous and it cannot be said to be repeated. You watch a car roll and it rolls very slowly. Vertical oscillations, directly vertical, which change the load upon the journal, repeat frequently, and those come equally upon both journals, and in that way make the strain between the wheels the same at all points, and that is one load we have to consider. The



Eight-Wheel Express Engine, London & South Western Railway.

Mr. W. ADAMS, M. Inst. C. E., Engineer.

center is about as 1 to $2\frac{1}{2}$, although the loads carried are about the same.

These engines are used in fast express service, the average speed being about 50 miles an hour for part of the

London & South Western Eight-Wheel Engine.

Inside diameter of cylinders.....	19 in.
Stroke of piston.....	26 in.
Diameter of boiler barrel outside.....	52 in.
Length of firebox shell outside.....	76 in.
Heating surface:	
Tubes.....	1,245 6 sq. ft.
Firebox.....	122 2 sq. ft.
Grate area.....	18 sq. ft.
Width of firebox.....	46 1/4 in.
Number of tubes.....	210
Diameter of tubes outside.....	1 3/4 in.
Thickness of engine frames.....	1 in.
Diameter of bogie wheels on tread.....	45 3/4 in.
Diameter of driving and trailing wheels on tread.....	85 in.
Center of driving to center of trailing wheels.....	102 in.
Weight of engine (in working order):	
On bogie.....	41,160 lbs.
On driving wheels.....	34,608 lbs.
On trailing wheels.....	33,264 lbs.
Total.....	109,032 lbs.
Tender.	
Diameter of wheels on tread.....	45 3/4 in.
Length of journal.....	9 in.
Diameter of journal.....	5 1/4 in.
Diameter of axle in wheel.....	6 1/4 in.
Diameter of axle at center.....	6 1/4 in.
Capacity of tank.....	3,300 gals.
Weight of tender in working order.....	74,368 lbs.

line, 46 miles for another part and $43\frac{1}{2}$ miles on parts of the line where the grades are about 1.3 per cent. The total train load, including the engine and tender is sometimes 310 tons.

The Strength of Car Axles.

At the April meeting of the Western Railway Club there was a pretty animated discussion concerning the strength of car axles which we give here at some length as supplementing the long article on the subject which has been printed in the last three issues of the *Railroad Gazette*.

Mr. D. L. BARNES: I was requested to open this discussion on the strength of car axles, and I have tried to prepare a diagram to start the subject off. It seems, from what I have been told, that there are a great many axles being broken now, on some lines, especially at the center and at the journal neck. This diagram shows that from the standard of engineering and architectural work, bridges, railroads and all steel structures, our axles are too weak. This diagram is for a $4\frac{1}{4} \times 8$ -in. journal. Along the bottom are given the fiber strains in pounds per square inch, that is for the top fiber, when the load

for steel and too high for wrought iron. If the axle were made straight between the wheels it would be just about as strong at the center of the axle as at the journal neck when new. The maximum strain to which axles are subjected is not that from the load as it stands on the track. It bobs up and down. When the spring is bent for oscillation there is more strain. Lately there has been considerable discussion on the point, and a Southern railroad man has written that the strain would no doubt reach double the load in oscillation; in fact, the theory of oscillation would point to that. This writer also says that, when the spring closes, as they do frequently, there is no way of calculating the strain. We do not know what it is, but it is no doubt a good deal more than it is when the car is standing still.

This diagram shows that double the load on the furniture or refrigerator car at the center of the axle gives a fiber strain of 28,000 lbs. One would say, "Why doesn't that axle break?" Well, the axle won't break if it is first-class material, until it has run a long way, because there is a certain probable life when the stress is above the elastic limit; but after a certain number of turns it will break. Perhaps that is shown by the fact that an axle, before it is put into service, will bend nearly double without breaking, but the same axle in service breaks short off. It was good material when it went in, but after being strained so much, it finally snapped off, because it was tired out or fatigued. This diagram shows that the $4\frac{1}{4} \times 8$ axle would be about right for a 40,000-lb. capacity car, and some railroads are using it for this, but those cars are sometimes, with the axle worn down to $3\frac{3}{4} \times 7$ in., marked up to 50,000 lbs. In fact, a railroad man told me to-day that he frequently sees $3\frac{3}{4}$ -in. axles carrying 50,000 lbs. There is a line, showing the strains for different loads, for a $3\frac{3}{4} \times 7$ in. axle, and showing how much weaker it is than the $4\frac{1}{4} \times 8$ in. under the same load, as might be expected. The thing of interest that this diagram of journal loads indicates is that the axle should be straight between wheels. Following out this line of reasoning, the axles under a 40,000-lb. car ought not to be less than $4\frac{1}{4} \times 8$, and they should be straight between wheels, even then, to make them strong at the center, and it also shows that a wrought iron axle is not safe according to M. C. B. standard dimensions under the cars for which it is designed. This question came up because some cars had broken axles, and the reason could not be found. The axles were of very good material. After they were broken in service at the center, the material at each side of the break would bend up like good axles. They were according to M. C. B. dimensions, and the chemical analysis was all right. But this diagram would show that they were overloaded.

I do not know why Mr. Barr assumes that broken axles are always caused by the small fillet or the heating of the journal. There is no reason why reasonable heating should hurt an axle that I know of, and breakage at a small fillet always indicates a low factor of safety. This diagram is not offered to show that axles do break (for that we have better evidence than a diagram or mathematics could give), but simply to show that the axles are strained above a safe limit by the journal loads

oscillating load is a minor one and very easily calculated. This vertical oscillating load is a much larger one and very difficult to calculate, particularly when the springs close, as they do frequently, on both sides, as you will find if you ride in a loaded freight car; and you would notice this a good deal oftener if it were not that the trucks are very elastic and they bounce up and down like a spring. If you had a rigid truck you would see that the springs close often. If you look at the cars you will see that it is the vertical load you have to consider.

The fact is that this diagram only shows that the M. C. B. axles would be strong enough to have a reasonable safety at the center if they were straight between the wheels. It does not and should not be taken to show that an axle should be straight between the wheels. It does show, however, that only a good axle should be used. The factor of safety in axles, according to engineering books, is less than in bridges, rails or structures I know anything about. It is not over two, generally only one and one-half, while in bridges you use five.

MR. A. M. WAITT (L. S. & M. S.): We use wrought iron, four and one-fourth by eight in. under 60,000-lb. cars. We know that once in awhile springs set and they get some hard bumps, but I never yet heard of those axles being broken in the center. In fact, I believe I have only seen one wrought iron axle broken in the center, and that was not the M. C. B. standard size. It was broken on account of its being small size. I have seen steel axles broken in journal one-third the distance from the inside end, but I have never seen wrought iron axles broken there except they showed that they had been quite hot. I have in mind several steel axles being broken at that point where there was no sign of being hot. The axles were new, four and one-fourth by eight, under 60,000-lb. cars. We had four or five of them break on the way from the manufacturer in one of our yards, and I am inclined to think that the trouble is from the wrong chemical analysis of the steel rather than from the size of the axles. If I had seen more of the wrought iron axles break under 40,000 and 60,000 lbs. capacity cars, when the axles were within the limits of the M. C. B. rules I should feel more strongly that it was necessary to increase the size of our axles and to carry them the full size across between wheels; but as I have not seen that in my experience I shall continue to use them the present size.

MR. J. N. BARR (C. M. & St. P. Ry.): I am quite sure that we have got some axles under our cars that have made more than 100,000 miles. Mr. Barnes has shown very clearly that we are straining these axles until it is absolutely unsafe to use them, and at the same time we are using them; and I would say, with about twenty years careful observation on axles, that I have never seen an axle of the M. C. B. size, either 40,000 or 60,000 lbs., that was broken at any place inside the wheels, that the breakage was not caused by wreck or derailment. As to breaking of journals, I find that that occasionally occurs, and I think that it is due, to a great extent, to the heating of the journal, also to the wearing away of the fillet. I am inclined to think that wearing of the fillet to a sharp corner on the inside end of the journal has caused more broken journals than all other causes put together.

I know, and I see from that diagram, that we are straining these axles to an unsafe point, and, too, that we are putting a load on our cars that places such a pressure per square inch on our journals that we cannot run them without making them hot. Mr. Barnes says that the theory of design of the axle requires it to be straight between wheels. I question whether any more dangerous practice could be indulged in than making our axles straight between wheels. I have made observations on driving wheel axles with that special object in view. Driving wheel axles give trouble in breaking. We obviate the trouble by turning down the center of the axle. I learned not long ago that the same trouble was quite prevalent in England and that they also applied that remedy and produced the same results. I do not know exactly upon what theory the statement is made that axles should be straight between centers, but I do know that if we made them that way we would have ten broken axles where we now have one.

The axle of the present day is a growth from our experience. We used to have experience with straight axles, axles with rather small wheel fits, and we found they broke inside of the hub. I remember very distinctly when that was not an infrequent occurrence. But we did not find them breaking in the center. Then the thing to do was to commence to build up the axle at the wheel fit. We did that; the result of which is that, so far as I know, we have had no trouble with breaking in the center, but have corrected the tendency to break inside of the hub, so that the axle, as it stands to-day, is the result of actual experience.

Mr. G. W. RHODES (C., B. & Q. Ry.): We had a very interesting paper presented to this club on axles, about seven years ago, which showed quite conclusively that

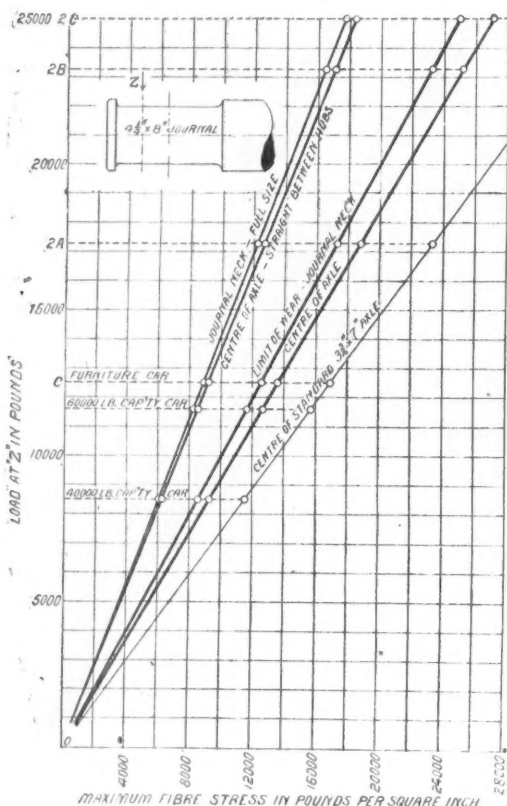


Diagram Showing the Stresses at the Journal Neck and at the Center of Car Axles for Journal Loads.

the tapering form was the correct construction. It will be interesting to compare the reasoning in these two expositions. Now, in regard to straight axles and tapering axles, those of you who will look back a little will recollect that we have had experience with straight axles. I can remember that 12 or 15 years ago, on a prominent road, many of the freight axles were straight. They were being abandoned. Why? Because of the large number of breakages. I am not quite prepared to say that those axles were proper size for the loads they carried, but at any rate they were straight from wheel to wheel, and the breakages were large. About that time was when the change came to the taper axle in the center, and I am a little of Mr. Barr's opinion that when we take into consideration the freedom from breakages, particularly in the center, that that is the proper form. In accord with what Mr. Waitt has said, I must say that we have on our line very few iron axles, tapered axles, that break in the center; I cannot think of any. The only two axles that I know of that have broken there in the last two or three years were both steel axles.

Mr. WM. FORSYTH (C., B. & Q. Ry.): I believe in approaching these questions somewhat in the way Mr. Barnes has done—in careful analysis of the loads which go on the axle, and the resistance of the materials, both as to shape and size. The reason why he has such astonishing results there, I think, is because he has evidently taken extreme cases in nearly everything. In order to explain why axles do not break with conditions like that, we will say that axles which do break are subject to about the conditions which Mr. Barnes has assumed. Now, for instance, the lower line there of the load of 8,000 pounds on journals, is what we get under our heaviest Pullman cars or heavy mail cars, with a total load of 115,000 lbs. With 60,000-lb. box or furniture cars I do not think the dead load on a journal exceeds very much 10,000 lbs. I do not know any theory, which would make a car axle straight between the wheels, except, perhaps, this one which Mr. Barnes has presented to us to-day, and another one which was advanced in a paper by Mr. Randolph before the American Society of Mechanical Engineers. But I think the mistake that both Mr. Randolph and Mr. Barnes have made is this: that they have assumed that when the maximum load was on one journal, that it was on the other journal at the same time. Now the fact is that when the center of gravity of the load is thrown over on to one journal, the other journal must necessarily be relieved to that extent. There is only the total load there—say 60,000 lbs.—and if 40,000 lbs. are going over on one side, there must remain but 20,000 lbs. on the other, so that whenever we have a maximum condition on one journal, we do not have it on the other. If we did then the straight axle would be

the proper shape, but as we do not, the strain diagram is triangular, which sustains our regular practice of making the axle taper toward the center. I think also, as Mr. Barr has stated, that the reduction of the axle at the center gives some amount of flexibility which prevents the breakage of the journals and which, in the constant vibration and shocks to which axles are subject, seems to be a necessary thing to prevent them from breaking. I believe, as he has stated, that the shape of the axle is a development which has come from long practice, and I also believe that a theoretical analysis will show the tapered form to be correct.

Mr. Barnes subsequently sent the following additional explanation about the diagram and the points raised in the discussion:

1st. The diagram was solely for repeating journal loads, and nothing was said about flange loads. Loads on both journals give an equal stress between wheels. Loads on one journal give a greater stress near one hub. Loads on one journal result from rolling oscillation, which is less frequently repeated than vertical oscillation, and therefore effects the life of axles less. Furthermore, the rolling oscillating load can be no more in amount than the vertical oscillating load. The rolling oscillating load does not occur generally at the same instant as the vertically oscillating load, and does not strain the axle so much at the center, and not any more at the hub. It is clear, then, that for the maximum repeating journal loads the axle is equally strained between wheels.

2d. Flange loads give a stress greater near one hub, and when the stress is determined for the maximum repeated journal loads a factor should be added to increase the size at the hub to allow for flange pressures which may occur often enough, on some crooked roads, to materially aid in spoiling the material in the axle. When this is the case, the stresses indicate that axles will fail at a point a little one side of the center. Many cases of actual failure show this.

3d. Some books that treat of stresses in axles refer to the rolling oscillation as the load that requires axles to be larger at the hub. This is wrong, as the greater, and more frequently repeated, stress of the vertical oscillating load covers the rolling load. It is the flange pressure that gives the unequal stress that is added to the stress from the journal load and must be provided for by a taper axle. This diagram does not treat of flange pressures. That they are very great everyone knows who has made a calculation of them.

4th. To taper axles to gain flexibility is, of itself, a bad engineering plan, and belongs to bicycle and airship construction more than to substantial car work. The deflection of an axle is so small, compared to the deflection of the truck springs, and to that of the frames and bolsters, that it is of practically little importance in reducing the stress on the journals; that is, so far as flexibility is any indication of the extent of the stress.

5th. Good material and rapid wear are the two factors that reduce the breakage of axles. Good material gives uniformity, and rapid wear reduces the time of service. If a mechanical engineer on a railroad approves of a design of axle of common sizes for common loads, he does so not because the stresses given by a careful calculation show the axle to be safe, but because the axles have stood similar service before, and therefore he judges they will stand it again, if of good material.

6th. The facts about the stresses from journal loads are given by the following table, and show whether or not the loads are excessive or safe. In no other country are such loads carried on railroad axles.

STRESSES ALLOWED IN IRON AND STEEL, UNDER REVERSING LOADS.

	Fiber stress, allowing 1/4 more car standing still.	Fiber stress, allowing 1/4 more load due to oscillation vertically.
3 3/4 x 7-in. axle:		
40,000-lb. car loaded. At neck	10,000	15,000
with journal 1/2 worn.....	12,000	18,000
Ditto at center of axle.....	12,500	18,700
50,000-lb. car, ditto at neck.....	12,500	20,200
Ditto at center.....	13,500	20,200
4 1/4 x 8-in. axle:		
60,000-lb. car loaded. At neck	10,000	15,000
of journal 1/2 worn.....	12,500	18,700
Ditto at center of axle.....	12,500	18,700
Furniture or refrigerator car, loaded ditto at neck.....	11,000	16,500
Ditto at center.....	13,500	20,200
Fiber stress allowed in bridges and other important railroad structures, where there is a repeated reversing load:		
Iron.....	4,000	
Steel.....	6,000	

NOTE.—The size of the journal to bring the fiber stress, at the neck, down to 8,000 lbs., allowing one-half addition for oscillating loads, would be, for a 60,000 lb. car, 4.9 in., and at the center 5.3 in. It is interesting to see that these are not large dimensions.

If this diagram had been discussed on its merits, as an analysis of stresses due to journal loads, as it was distinctly marked and described, the discussion would have been more useful. But as it now stands, the diagram has been misunderstood, and has been taken as an argument that axles do frequently break in service. Such is not the case and the diagram was not intended to show it.

An Electric Brake.

The Chicago General Street Railway Company has an electric brake in use on motor and trail cars that has proved satisfactory. It is the invention of Mr. Elmer H. Sperry, of Cleveland, O., and has had a careful trial on the Twenty-second street line of this company.

The brake for motor cars consists of an annular disc of cast iron in which a coil of wire is buried so as to be protected against injury. This disc is cast with a groove on the side, which, after the coil is inserted, is closed by a cover of similar metal and the cracks stopped with babbit. This surface is then finished smooth. On the inside of the wheel is cast a flat surface which is also turned smooth. The disc is cut out on the upper side so as to be placed on the axle without removing the wheel, and is suspended from the truck so that the smooth side is against the wheel. This suspension is by a link on one side and an arm working between two guides fastened to the truck on the other, the action of gravity keeping it from rubbing against the wheel. The adjustment of the disc with reference to the wheel is by a split collar in the axle, the disc being set at about 1/8 in. from the

wheel. A brush on the disc keeps the finished surfaces clean.

The coil in the disc is connected with the controller, so that after the current is shut off from the motor a further turn of the controller handle puts the coil in series with the motor, which, then acting as a generator, magnetizes the disc and causes it to hold the wheel. The strength of the current is regulated by the same resistance-boxes as are used in starting the car. By cutting out all resistance the disc will engage the wheel so tightly as to arrest its motion for a moment, but will not slide the wheels for any distance, because the stoppage of the wheel will cause the current to cease, and the disc then releases the wheel. By the construction of this brake no extra power is necessary, the forward motion of the car itself generating the current which applies the brake, and the position of the trolley, whether on or off the wire, is immaterial.

On the trailer cars a split disc is bolted to the axle, instead of being on the wheel, and the coils are in multiple with those on the motor car. Two brakes are used on each car.

Supt. W. F. Brennan, of the Chicago General Street Railway Company, to whom we are indebted for this information, is much pleased with the brake, and his company was the first to adopt it.

The Rules of Interchange.

At the April meeting of the Western Railway Club a discussion was held on the report of the Committee on Revision of Rules of Interchange, which was submitted to the club at the February meeting. As the discussion on the proposed changes was extremely long we will give only a summary of the recommendations:

Rule 3.

Opening paragraph to be changed to read as follows:

Cars may be refused for any of the following defects: If in the opinion of the road they are unsafe to run, or unsuitable for carrying freight, or if they have defects for the repairs of which the receiving roads are not authorized to bill.

In section (b) to substitute the word "and" for the word "or" in the third line.

Rule 4.

To add after the words "cross-tie timbers" the following:

"Such cards shall not be required for defects for which owners are responsible. In the case of missing material, the receiving road may require a defect card covering such missing material, which card shall be a voucher against the railroad company furnishing the card for scrap value of the missing material, except in the case of M. C. B. couplers, brake beams, brake levers and connections."

Rule 7.

To be amended to read as follows:

Locks, grain doors, and inside parts of cars, are at owner's risk.

Rule 8.

To be amended to read as follows:

Car owners shall be charged for the repairs of their own cars, with the following exceptions:

(a) Damage caused by derailment, wreck, train parting, collision, fire, or evident carelessness in handling car shall not be chargeable to owners.

(b) Charges for damage to draft rigging and sills shall be made in accordance with the following, the parts referred to being:

1. Couplers, or drawbars.
2. Drawbar springs.
3. Drawbar pockets, spindles, or their substitutes, and followers.
4. Draw lugs and attachments, carry irons, and filling blocks.
5. Draw timbers or substitutes.
6. Dead wood or buffers.
7. End sills.
8. Longitudinal sills.

Damage to any of the items above numbered 1 to 8, shall not be charged for if accompanied with damage to other items, as follows:

1. If accompanied with damage to either 4, 5 and 7.
2. " " " " " " 4, 5 and 7.
3. " " " " " " 4, 5 and 7.
4. " " " " " " 1, 2, 3 and 7.
5. " " " " " " 1, 2, 3 and 7.
6. " " " " " " 7.
7. " " " " " " 1, 2, 3, 4, 5 and 6.
8. " " " " " " 7.

(c) In the case of damage to longitudinal sills, bill shall not be rendered for more than two sills.

(d) No bill shall be rendered for more than two end or two corner posts on same end, or for more than one end or one corner post.

(e) Any damage caused by cornering or raking cars to be assumed by the company so damaging the car.

(f) In replacing brake shoes no labor shall be charged and no credit for scrap.

(g) Journal bearings needing renewal, no charge to be made for labor of renewing, and an arbitrary scrap credit shall be allowed for one-half the weight of the bearing applied.

(h) If repairs chargeable to owners exceeds \$5 for any one car, notice descriptive of the same shall be sent at once to the owner of the car, and no bill shall be rendered for less than 25 cents.

(i) In case any car owner desires any other car owner to hold material for inspection or orders, removed from cars and chargeable under paragraph (b), the same shall be held, after notice has been received, for a period not exceeding 30 days subsequent to the date of the receipt of the notice.

Rule 10.

To omit Rule 10 entirely.

Rule 12.

To change the table of prices to read as follows:

	New.	Second hand.	Scrap.
One 36-in. wheel.....	\$3.00	\$6.00	\$4.00
One 33-in. wheel.....	6.50	5.00	3.00
One 30-in. wheel (or less).....	6.00	4.00	2.75
One axle, 60,000 lbs.....	8.00	5.00	3.50
One axle, 40,000 lbs. (or under).....	7.00	4.50	3.00

To cancel all that follows after the eighth line under the table of prices, and make it read, "with the following exception":

In case the owner of a car removes a damaged wheel or axle no charge shall be made for any difference in value between parts used and those removed that are not damaged.

Rule 16.

To omit the last eight words, viz.: "Including a wrong drawbar in the latter case."

Rule 17.

To add at end of last paragraph the following words:

"Thirty-three inch cast-iron wheels for 50,000 and 60,000 lb. cars shall not weigh less than 550 lbs. each. Thirty-three inch cast iron wheels for cars of less capacity than 50,000 lbs. shall not weigh less than 520 lbs. each."

Rule 18.

To amend the last sentence of last paragraph to read:

"The slicing of two adjacent sills at the same end of the car, or any sill between cross-tie timbers, will not be allowed."

Rule 19.

To add the following:

"Evidence of wrong repairs having been made under Rule 8, or disregard of the requirements of sections a, b, c, d,

and e. will be authority for refusal to pay the bill, or for counter-bill, if bill has already been paid."

Rule 23.

To make truck price table read:

Trucks.

With wood transoms, one pair, including brake beams and brake levers.....\$200
With metal transoms, one pair, including brake beams and brake levers.....250

Rule 26.

To change the prices of doors, etc., to read:

	Charge.	Credit.
1 box car side door, applied.....	\$3.50	.....
1 box or stock car ventilated side door, wooden frame, with iron rods, applied.....	4.00	.....
1 box car end door, applied.....	1.75	.....
1 box or stock car ventilated end door, wooden frame, with iron rods, applied.....	3.00	.....
1 box or stock half side door applied.....	3.00	.....
Make "Air brake hose and coupling complete, applied, \$2.00," read "14 in. air brake hose, etc., etc."		
Also add the following:		
1-in. air brake hose and coupling complete, applied.....	1.75	.....
Renewing burst or worn out 1 1/4-in. hose, including credit for fittings, applied.....	1.00	.....
Renewing burst or worn out 1-in. hose, including credit for fittings, applied.....	.75	.....

To change hours of labor in replacing sills, etc. given on pages 32 and 33 of the Rules as follows: [Items in which no

tavo pages and covers the subject pretty thoroughly, and is supplemented with a bibliography of books and papers on light railroads in France, Germany and Italy, these publications covering the period from 1870 to the end of 1893.

In the last 15 years a remarkable development of steam tramways has taken place in Italy and a perfect network of lines is now in existence in the valley of the Po as well as around important centers in other parts of the peninsula, and these roads do a large freight as well as passenger business. While they are really secondary railroads there is this distinction between steam tramways and light railroads, that the tramways are laid on ordinary high road without any fencing off from the carriage way, the speed being limited. In the case of these steam tramways the government fixes rigid regulations as to type of locomotive, composition and length of train, and speed.

At the end of 1890 there were 1,575 miles of steam tramways in Italy and about 300 miles have been constructed since. (The paper has no date, but it appears to cover the end of 1893.) The rate of construction has much diminished since the close of 1890, partly because of the

tice in this country, the use of coach screws having shown unfavorable results.

There is no practical limit to the radius of curvature. Curves with radius as short as 20 yards are often found. The rigid wheel base is on the average 5 ft. 3 in. and the cars and engines pass the curves easily, the gage being slightly loose on the curves. The grades are limited only by the adhesion. On the line from Rome to Tivoli the maximum gradient is 1 in 14 1/2, which is said to be the steepest used. In Genoa there is a line with grades of 1 in 15. In the neighborhood of Turin there are several grades of 1 in 20. All of these are worked with 4-wheeled locomotives weighing in working order not more than 16 tons. In one case only, in Naples, namely, a rack is used, this being laid like the rails flush with the road surface and being in the middle of the track.

With but few exceptions these tramways are single track. They are provided with passing places which are usually outside the high road. These passing sidings are often, perhaps usually, 359 ft. between switch points, giving 197 ft. of clear passing length. The length of trains is limited to about 130 ft. Wherever possible these passing places are on public ground or at regular stations



Map of Northern Italy, Showing System of Steam Tramways.

change is made are omitted. These figures are for "all other cars," not for "refrigerator cars."

	Hours.
1 side sill replaced.....	21
2 side sills replaced.....	39
1 center sill replaced.....	32
2 center sills replaced.....	38
1 side sill and 1 center sill replaced.....	48
1 side sill and 2 center sills replaced.....	53
2 side sills and 2 center sills replaced.....	71
1 inter. sill and 1 center sill replaced.....	38
1 inter. sill and 2 center sills replaced.....	43
2 inter. sills and 1 center sill replaced.....	43
2 inter. sills and 2 center sills replaced.....	48
3 inter. sills and 1 center sill replaced.....	54
3 inter. sills and 2 center sills replaced.....	59
4 inter. sills and 1 center sill replaced.....	54
4 inter. sills and 2 center sills replaced.....	59
1 side, 1 inter. and 1 center sill replaced.....	53
1 side, 2 inter. and 1 center sill replaced.....	58
2 side, 2 inter. and 1 center sill replaced.....	76
1 side, 3 inter. and 1 center sill replaced.....	63
2 side, 3 inter. and 1 center sill replaced.....	81
1 side, 4 inter. and 1 center sill replaced.....	68
2 side, 4 inter. and 1 center sill replaced.....	86
1 side, 1 inter. and 2 center sills replaced.....	58
2 side, 1 inter. and 2 center sills replaced.....	76
1 side, 2 inter. and 2 center sills repl. c'd.....	63
2 side, 2 inter. and 2 center sills replaced.....	69
1 side, 4 inter. and 2 center sills replaced.....	74
2 side, 2 inter. and 2 center sills replaced.....	87
2 side, 3 inter. and 2 center sills replaced.....	86
2 side, 4 inter. and 2 center sills replaced.....	91
1 side plate replaced.....	25
1 end plate replaced.....	11
1 spring plank replaced.....	5
1 brake beam replaced.....	1

An additional charge of \$1 for five hours' labor shall be allowed in replacing intermediate or center sills on cars equipped with air-brakes:

Steam Tramways in Italy.

We have long had it in mind to write a paper on the remarkable development of the steam tramway system in Italy, but fortunately we have waited so long that somebody else has saved us the trouble. In the Selected Papers of the Institution of Civil Engineers appears a translation and abridgment made by Mr. P. W. Britton of a paper by Mr. P. Amoretti, Manager of the Steam Tramway Association of Turin. Accompanying the paper is a map of the steam tramways of Northern Italy which we reproduce. The translation fills 17 small oc-

commercial crisis through which Italy has been passing and partly because of the unsatisfactory results of the working of many of the lines. Naturally, the lines began first as suburban lines about the large cities. They were gradually joined up and adapted for through business, although this development was impossible where varying gages had been adopted, which should be a warning to all light railroad advocates. The greatest extension of through working is in Lombardy, and an important part of the system there is the circular line at Milan, connecting all the lines which converge on that city. Freight can be carried considerably over 100 miles. In many cases railroad cars can be run over the tramways which is often seen on the tramway lines radiating from Pisa. About 36 companies, working 1,365 miles form the Italian Tramway Association which has arranged a common basis of working.

Generally these tramways are the standard Italian railroad gage, 4 ft. 8 1/2 in. The rail level exactly coincides with the road surface, and it was originally required that the space between the rails should be paved or metalled exactly like the rest of the roadway; but now the metalling is often left rough, so that while vehicles can cross the line there is no inducement for them to remain on it.

The ordinary roads are from 26 ft. to 29 ft. 6 in. wide and a single tramway track is always placed at one side, leaving 18 ft. 8 1/2 in. as a minimum between the inside rail and the other side of the road. Where the roads are 32 ft. 10 in. or more the tramway is separated from the roadway by a line of spur stones. In city streets the line is usually laid in the middle of the roadway, but where the streets are narrower it is put to one side, the minimum distance from the outside rail to the nearest wall of the house being 3 ft. 11 ins.

The rails are all of the T-section, laid directly on the cross-ties on tangents and on chairs on curves. The weight of rail is 36 lbs. to the yard, but where the engines weigh over 12 tons or the traffic is heavy, a weight of 42 lbs. is used. The ties are always of oak and the rails are spiked as in our ordinary steam railroad prac-

as the tramway companies have no compulsory powers for the purchase of land. The stations are all the simplest possible, and at unimportant points there is no building, a sign board indicating that trains will stop.

By the fact of their construction on the high roads these lines give direct communication to farms, gardens, mills and all sorts of industrial establishments in a manner unattainable on a scale so general by ordinary railroads. The trucks are loaded direct and run without transfer to the point of distribution, and so supplies are brought from the cities. The companies have been ingenious in facilitating loading and unloading. For instance, for conveying bricks and tiles near Turin simple platform cars are used; the bricks or tiles are stacked in open cages. On arriving at Turin these cages are slung off by a crane to carts and so carried to their destination without any intermediate handling, which, of course, is not only a saving of labor but of material. Another special class of work is carrying sewage matter from Milan to the outlying sewage farms. This is carried in iron tanks on ordinary carts to the tramway station, where the tanks are slung on the platform cars by a crane. At their destination these tanks may be emptied into a large reservoir or conveyed by cars to the fields.

Some of the companies restrict their shop work to small repairs, sending damaged rolling stock to outside works for extensive repairs. Others have shops equipped for all required repairs as well as for the construction of cars. Engines are mostly built in Germany and Belgium.

The amount of equipment of the different lines varies greatly. An approximate average gives the number of engines as from 0.12 to 0.19 per mile of line; the number of passenger cars, 0.3 to 0.6, and freight trucks, 0.3 and 0.6.

Under the government requirements the initial working pressure of the boilers is 176 lbs. per sq. in., this allowance to be reduced about 7.35 lbs. each year for four years. A boiler must be tested annually by hydraulic pressure in the presence of the Government inspector to 1 1/2 times the working pressure. Every four years it must be thoroughly examined internally. It must have two safety-valves fitted with an accepted brake and on very

steep lines two independent brakes must be provided. The engines are housed in, like our well-known dummies. Usually they have two axles though 3-axle engines are employed on very steep grades. Generally they have inside cylinders. The total weight in working order, is from 8 to 16 tons, an exceptional maximum being 20 tons. The cylinders vary from 7 to 11 in. in diameter. The usual type in 12 to 14-ton engines is 9½ in. The axles are 5 ft. 3 in. apart, and the wheels are 1 ft. 11 in., or 2 ft. 2¼ in. in diameter. Neither condensers nor smoke consumers are used. Welsh coal is generally burned and spark guards are fitted in the chimney. These engines are provided with light snow-plows in the winter.

The passenger cars have 16 seats and 16 standing places first class, and 24 seats and 16 standing places second class. Mixed cars are also used. These are two-axle cars—the axle rigid. In a few cases longer cars on bogie axles have been tried, but generally the smaller ones are preferred as being more easily adapted to the requirements of the moment. In the summer, open cars are largely used. These cars weigh from 3 to 3½ tons, the open cars from 2 to 2½ tons. The freight trucks are much like those used on the railroads, ranging in capacity from 1 to 8 tons and weighing empty from 2½ to 3½ tons for open trucks and 3½ to 4½ for covered vans. Nearly all of the cars, freight and passenger, have brakes, usually chain brakes on the passenger cars and screw brakes on the trucks. Continuous brakes are used, but in few instances. The Neapolitan Companies have a compressed air brake; the Sicilian Company has the Westinghouse brake and another company uses the Bode buffer brake. Generally, however, hand brakes are used, as the low speed of the trains does not seem to justify the use of a more costly apparatus.

The original regulations for trains to be run on public roads were: Maximum weight of train, including the engine, 30 tons; maximum length, 100 ft. These limits have been extended for trains running from 10 to 12 miles an hour. Six vehicles in addition to the engine are allowed and still longer trains are permitted if the speed is lower. The earliest authorizations were for a maximum speed of 8½ to 9 miles an hour; later the limit was raised to 11 miles, and in many cases recently it has been increased to 12 and even 15 miles. This, however, is the maximum speed. Allowing for stoppages the average is considerably less.

The fares range from 1.84 cents to 2.14 cents per mile, first class, and from 1.22 to 1.52, second class, although in many cases the actual fares are lower than these. Considerable freedom is allowed in fixing the freight rates, but they are low.

The average cost of construction cannot be stated accurately as the work has been done under such varying conditions. A possible approximation seems to be from £1,280 to £1,920 per mile for construction. This does not include cost of land or station buildings or rolling stock. Perhaps a fair average would be £2,600 per mile, including all items—say \$13,000. Leaving out of consideration exceptional cases of bad and of good earnings, the average gross earnings are put at about £400 per mile per annum. It is extremely difficult to get at any average of working expenses. The average of returns which the author has been able to analyze give in round figures £300 per mile, or 75 per cent. of the average gross receipts. The net earnings are therefore about £190 per mile, and the aver-

An Instruction Car for Trainmen.

In June, 1893, Mr. W. J. Walsh, Engineer of Tests on the Cincinnati Southern, was asked to prepare an instruction car, by means of which the employees of the Cincinnati, New Orleans & Texas Pacific could be properly instructed in the use of air-brakes and electric headlights. Through the courtesy of officers of the road, we are able to present some interior views of the car and a description of it.

The car, formerly a baggage car, is 10 x 56 ft. out to out of platforms. At one end is a six-wheel truck with 33-in. wheels, and at the other a four-wheel truck. The six-wheel truck is used not only for purposes of instruction, but also because the larger portion of the weight of the car is at that end. The car, with its appliances, weighs 77,000 lbs., 45,000 lbs. being carried by the six-wheel truck. Under the car on one side is a Pintsch gas cylinder, 20 in. x 4 ft., and on the other an air cylinder of the Frost car lighting system is suspended.

Beginning inside the car, at the end over the six-wheel truck, there is seen first, to the right, a 24 in. vertical boiler, 6 ft. high, for supplying steam to run an 8-in. Westinghouse air pump fastened near by on the side of the car. This boiler also supplies steam for the engine of the electric headlight dynamo. The air pump has a Nathan lubricator, and a Westinghouse governor which controls the pressure of the air in the main air reservoir referred to farther on. This governor is wholly automatic, and by means of it the pressure in the reservoir is maintained at 70 lbs., the pump raising the pressure to 70 lbs., and then stopping until the pressure falls, when it instantly comes into action again.

Next on the side of the car are complete air brake equipments for a passenger car, a tender, and a driver of an engine. The first is shown in Fig. 3. Each of these equipments is of the Westinghouse type. The different cylinders are intended to show the difference in the travel of their pistons, and

cylinder when the brake is applied. A sectional plain triple valve is connected with the driver brake triple valve by a piston rod, so as to show the movements of the parts while working. All connections and fittings properly used with the cylinders are attached to them, and the working of each plainly shown.

Next on this side of the car, near the door and resting

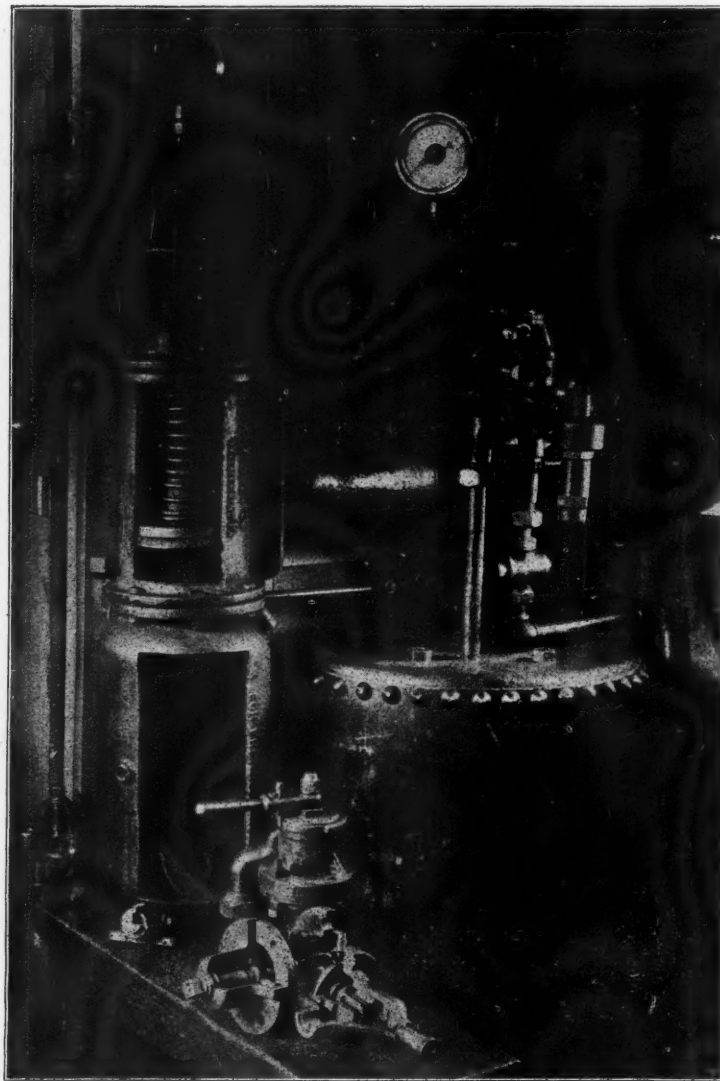


Fig. 1.—C., N. O. & T. P. Instruction Car.

on the floor, is the main air reservoir, 26 in. diameter by 34 in. high, from which the air for all the appliances in the car is supplied. (See Fig. 1.) Above the reservoir, and connected with it by a 1-in. pipe, 12 in. long, is the engineer's brake and equalizing discharge valve. Back of this, and connected with it, is an equalizing reservoir. Above the brake valve and to the right, fastened to a partition across the car, is a Westinghouse duplex gage, which shows the pressure in the reservoir, and also in the train pipe. To the left of this is a single gage connected with the air signaling apparatus of the Westinghouse type, to show the pressure in it. Connecting with the air reservoir is a ¾-in. reducing valve intended to keep a uniform pressure of about 25 lbs. in the pipes of the signaling apparatus.

Upon the other side of the car, on a box built against the partition, is a National electric headlight dynamo and engine, having a capacity of one arc light of 1,500 candle power. The headlight reflector, fastened on a movable platform and seen in Fig. 3, and the dynamo, have all the necessary connections and fittings, so that the engineer can be instructed in the use and repairing of each particular part. The dynamo and engine are shown in Fig. 2, the dynamo cover being raised. Over the dynamo engine and fastened to the partition is a junior Lunkenheimer lubricator. All passenger engines on this road are equipped with electric headlights, and all are working satisfactorily. They are not used at present on freight engines.

Near the dynamo, and securely fastened to the floor, is a 1-in. pipe 4 ft. high, with thread and union on the upper end, upon which are placed, when trainmen are being instructed, sectional parts of various brake appliances. This is shown in Fig. 2. The sections are full size, only so much of the outside cover or portion of each being removed as is necessary to clearly show their construction and use. Some of these sections are shown on a bench in Fig. 1.

Near this pipe, and fastened on the side of the car, is a gage of the Frost lighting system, showing the pressure of the air in the drum under the car. Next along the side of the car are several movable benches for the use of employees while receiving instruction and being examined. Further along is a Leach sanding apparatus for the instruction of enginemen. It shows the method of sanding the track by the use of air, as practiced on the C., N. O. & T. P. A washbowl, towel-rack and mirror, for the convenience of the men are also provided. In the corner of the car, opposite the water tank, is a 600-gal. water tank.

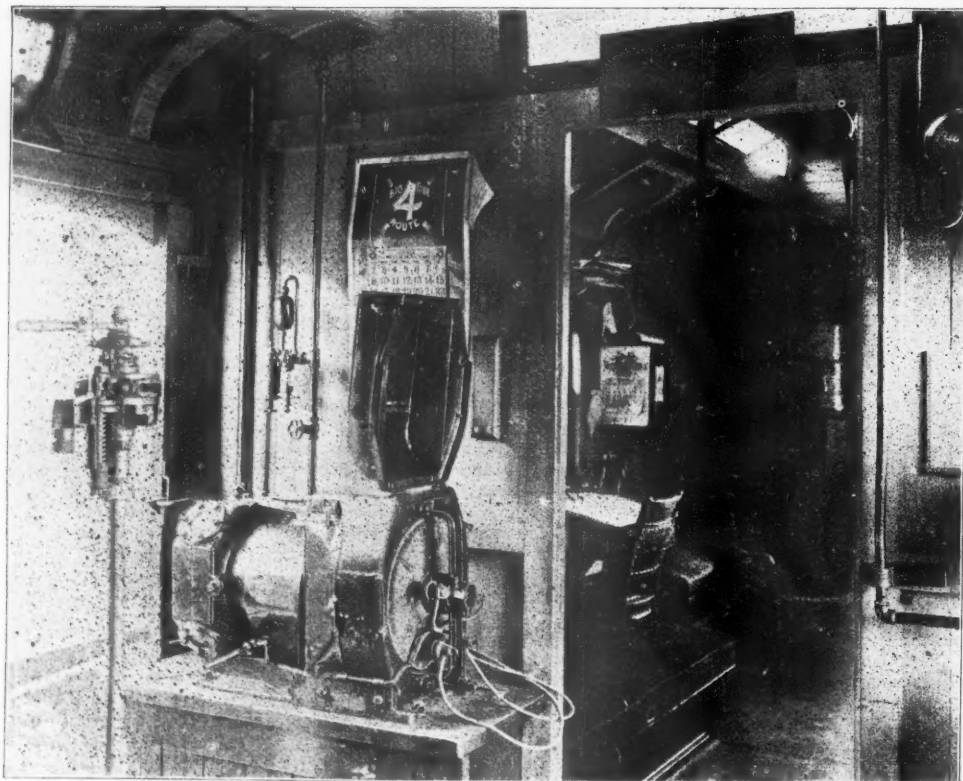


Fig. 2.—C., N. O. & T. P. Instruction Car.

age dividends on ordinary shares are about 3 per cent. This rate has been maintained for some time in the face of continued commercial depression, and has recently shown sufficient signs of improvement to justify the hope of more prosperous conditions in the future.

especially to impress upon trainmen, inspectors, and all who have to do with the air brake, the importance of having the travel uniform. Gages show the charging of the auxiliary reservoir, with both plain and quick action triple valves, and also show the braking force in the

Along the center of the car are 15 freight car air-brake cylinders, placed in an upright position, in tandem, on a strong frame made of T and bar iron. Connected with them are the pipes, exact counterparts of such as are suspended under freight cars equipped with air brakes. At the middle of the pipes are rubber hose connections, as used between cars. All employees are instructed in the use of these. The idea in having so many cylinders is to show that the air brake can be used as well on a long train as on a short one. An extra cylinder, with one-

The Standard Code on the M., K. & T.

The Missouri, Kansas & Texas has recently issued a new code of rules, of which those from 1 to 121 and from 501 to 527 conform in general to the standard code as amended in April, 1894. The principal additions are as follows:

20 (Second paragraph). Dispatchers on their respective divisions will require the acknowledgment, by all conductors and enginemen, of the receipt of a new time-

at a place where the view in the rear of the train is clear for at least half a mile, but not at the foot of the grade, and the train must be protected as per Rules 99 and 99 A.

105 (A). In case of delay to any freight train of ten minutes or more, any following train overtaking it may pass and run ahead without orders, but where an extra train passes a section of a regular train, it must notify all opposing trains of having passed such train.

119 (A). Enginemen of freight trains must get "go ahead" signal from rear end of train before passing any station or side track that is designated on time table. Brakemen must not give "go ahead" signal without instructions from conductor.

120 (A). At stations where a yard force is employed, trains, or engines without trains, will be under control of Yardmaster, and road crews of trains entering such stations will be responsible for their respective trains, or engines, until the same is taken charge of by the Yardmaster or his representative.

At such stations switching engines may work within yard limits without special orders, but must clear main line for all trains, as per rule No. 83.

120 (B). At stations where no yard force is employed, and where change is made in engine or train crews, the crew bringing train or engine in will be held responsible for the safety of same until delivered to the relieving crew.

516 (A). Conductors are required to read to the rear brakemen and enginemen to the firemen all train orders upon receipt of same.

517 (A). When the Train Dispatcher on duty delivers in person to a conductor an order that has been sent to trains at other stations, the conductor will read the order aloud to the Dispatcher, who will underscore it in his book in the same manner as when repeated over the wire. "Complete" must not be written on such order until this has been done.

521 (Third paragraph). An operator must not acknowledge the receipt of an order for a train that is at his station, the engine of which has passed his train order signal, until he has personally notified the conductor and engineman that he has orders for them.

For Rule 524, form B is used.

524 (C). If an operator receives an order to hold a train, or receives an order addressed to a train which is at his station, he must not repeat the order until the conductor of such train has seen and signed the same, whether it be a "31" or a "19" order.

Various other rules, called "Special Instructions," including some on general subjects and some on local, are numbered from 200 to 245. Nos. 300 to 328 have to do with air brakes, and then follow about three pages on train air-signals, continuous steam heating, Baker heaters and Pintsch gas. In general, these last five subjects are treated with commendable brevity and apparently with sufficient fullness.

New Plants for Electric Transmission.

The first of the electric plants described below, that of the Sacramento-Folsom Light and Power Co., which is being built to supply power to Sacramento for electric lighting and power, is one of the first attempts in this country to transmit electric power on a large scale. The work, which is now nearly completed, comprises a very large dam, two canals, a power-house, etc. It was contemplated, on a small scale, in 1866, but was not begun till 1888, when convict labor was secured. At that time the plans were much enlarged.

The dam is 650 ft. long, 89 ft. high in the center, 87 ft. wide at the base, 25 ft. wide at the crest, and contains about 48,500 cu. yds. of solid masonry. It is provided with a wooden flashboard, six feet high, which at high water is lowered into a recess in the crest of the dam. At low water this shutter is raised by hydraulic pistons, the depth of the basin is increased by six feet and additional storage capacity for the waste water provided. Normally the dam forms a storage basin or reservoir, three and one half miles long and has a capacity of 13,000,000 cu. yds. of water.

The West Side canal is not yet completed, but is designed to be 40 ft. wide at the top, 30 ft. wide at the bottom and 6 ft. deep. It is intended principally for irrigation purposes.

The East Side Canal is completed from the dam to the site of the power-house, a distance of about two miles. It is 50 ft. wide at the top, 40 ft. wide at the bottom and 8 ft. deep, having a capacity of about 87,000 cu. ft. of water per minute. The canal, divided into three sections, follows the bank of the river for about two miles and is constructed partly of masonry, partly in deep, solid rock cuts, and partly by earth cuts and fills. Just before it reaches the power-house of the Sacramento Electric Light & Power Co., it has been widened into a log basin to hold logs for the American River Land & Lumber Co., which will erect a large electric saw mill at this point.

The power-house of the Electric Light & Power Co. is at the end of this canal. Here a head of 55 ft. will be had, at high water. A rock cut has been made at this point, 60 ft. deep, 100 ft. wide, and 150 ft. long, from which a channel 40 ft. wide leads to the river.

The turbines at this point will consist of four pairs of wheels of the McCormick horizontal shaft type with 8-ft. steel inlet pipes, and double discharge tubes. These wheels will be direct-connected to four generators, one of which is a reserve.

The generators, the first of which is now being shipped, the motors, transformers and other apparatus are all made by the General Electric Co. The generators, which are the largest of the three-phase type yet manufactured have 24 poles and generate current at a pressure of 800 volts and the standard frequency of 60 cycles per second. The full-load efficiency of these machines is 96 per cent. The wheels will be run at 300 revolutions per minute, under a 55-ft. head. The tail water will all be used for irrigation purposes.

The 800 volt current will be raised by means of 9 step-up transformers of about 330 H. P. each to 11,500 volts before transmission.

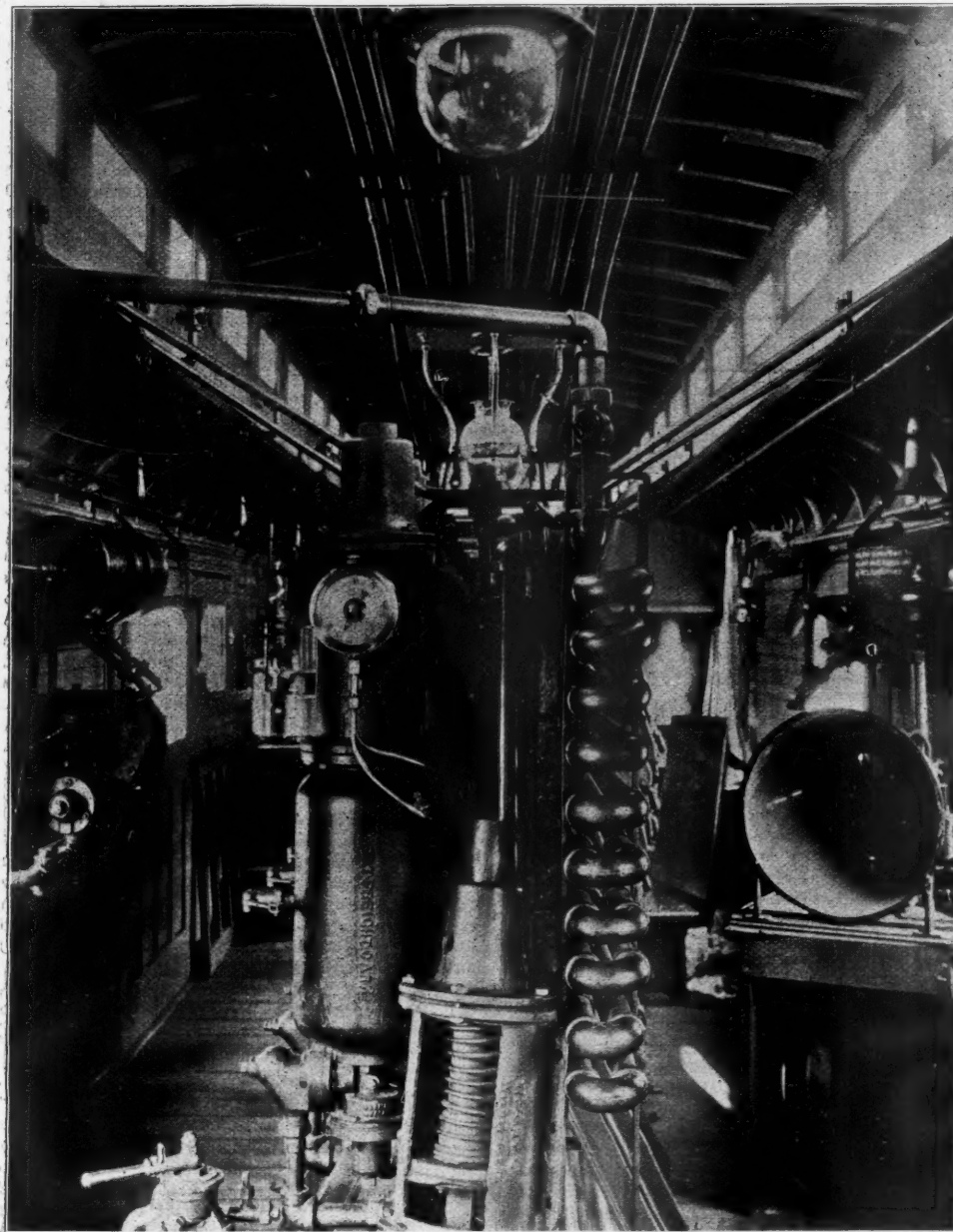


Fig. 3.—C., N. O. & T. P. Instruction Car.

quarter of the outside removed, is used to show the interior construction and working. (See Fig. 1.). There is an average length of 40 ft. of $1\frac{1}{2}$ in. pipe to each brake cylinder, or 600 ft. to the car.

Suspended in the top of the car are two Pintsch compressed gas lamps and two Frost burners. The Pintsch gas reservoir is underneath the car, with $\frac{3}{4}$ in. iron pipe connections to the burners. In the Frost system the air cylinder is suspended below the car and the gas is forced from the carburettor above down to the burner. There is also in the top of the car 330 ft. of $\frac{3}{4}$ in. iron pipe equal in length to that required for six passenger cars, and used with the Westinghouse signaling apparatus. A whistle, such as is fastened in the corner of an engineer's cab, is connected with it. Tacked on the sides of the car are sectional cuts of various appliances. Everything so far mentioned takes up 36 ft. of the length of the car. The rest of the car is used as an office, and is fitted with berths, etc.

The employees are carefully and thoroughly instructed, and if, after instruction, any one is found to be deficient in understanding and incapable of properly using the appliances, he is suspended without pay until he learns. All employees of the road are required to have a percentage of at least 8 in examination, 10 being perfect. The examinations are made about twice a year, and every employee who has to do with the airbrake must submit to them each time they are held.

Mr. Walsh is in charge of the car and makes it his home while on the road. Classes are held at certain hours, although Mr. Walsh is ready to instruct employees at all times. He is accompanied by an apprentice from the shop at Ludlow, and a new one is taken out each trip. Mr. P. H. Schreiber, Division Mechanic at Chattanooga, where the car was stationed while this account was being written, speaks highly of the practical results obtained from its use, as shown in the reduction of repairs to air brakes, etc.

table after it has taken effect before they are permitted to start on their run with any train or engine.

89 (A). Operators will set red signal immediately after the departure of a train, and will keep it set the required time in order to preserve the time between trains as per Rules Nos. 87, 88 and 89. Should a following section, or a train of any kind, arrive before the time has expired, the operator will hold them until that time is up, and then give them a clearance if there are no orders for them.

89 (B). When one train overtakes another, and it becomes necessary for the second train to help the forward train, the engine of the second train will in every case uncouple from its train before proceeding to help the leading train.

94 (A). Enginemen must test their brakes by applying the air lightly a sufficient distance from railroad crossings, drawbridges and junctions and know that they are in good working order. Should it be found that the brakes are not in good order, enginemen will signal trainmen to apply hand-brakes in ample time to admit of the stop being made at the proper place. No excuse will be accepted for engines or trains running by stop boards.

95 (A). Freight and extra trains are required to approach and pass all water tanks, coal chutes and stations completely under control. Speed must be reduced and the engineman and trainmen must commence to get their train "in hand" in ample time, so that under no circumstance whatever shall it be possible for it to strike any train, car or engine which may be occupying the track. The responsibility for safety rests with the approaching freight or extra train.

99 (A). When on a curve or down grade, the flagman must go back a distance at least 20 telegraph poles farther than as above provided, and as many more as may be necessary, before placing torpedoes to give approaching trains ample time to stop.

99 (B). When a flagman goes back to protect his train, as per Rules Nos. 99 and 99 A, and is recalled before he has gone the required distance, he will place two torpedoes on the rail 30 ft. apart and then return to his train, provided the track is straight for at least three-quarters of a mile in the rear of the train, the view unobstructed by fog or otherwise, no passenger train due within 10 minutes, and no following train in sight. If the conditions are otherwise he must be governed by Rules 99 and 99 A.

99 (C). When it is necessary for a train to stop between stations for any cause, it will, if practicable, be stopped

The transmission line is 21 miles long from the Folsom power station to the Sacramento sub-station, where the current is received at a pressure of about ten thousand volts, a loss of 8 per cent. being allowed in the line. Here the voltage is reduced, as required for various purposes, by means of step-down transformers. These large step-up and step-down transformers have a full load efficiency of 98 per cent.

The pole line is double, to provide for accidents, and runs along the route of the Sacramento & Placerville Railway. Each circuit will consist of three bare copper wires on porcelain insulators, and each pole carries two cross arms, for two circuits of three wires each.

The incandescent lighting, commercial arc lighting and stationary motor work in the central portion of the city, will be effected on a low tension modified Edison three wire system by feeders from the secondaries of the step-down transformers supplying current to a network of mains. The motors will be of the three phase induction type, and can be connected to the mains at any point. The street and arc lighting will be done on the constant current series system, while outlying motors will be operated from higher potential lines with individual transformer reduction, or will be high potential synchronous motors.

In this connection it is of interest to note the new power plant to be constructed in the Stuck Valley, 10 miles east of Tacoma, Wash. The White River Water Power Co., with a capital of \$2,000,000 has recently been incorporated. Water will be carried to Lake Tappa, from the White River near Buckley. From this lake as a storage reservoir, the water will be diverted to the edge of the bluff overhanging Stuck Valley. A fall of 500 feet to the power-house, will develop by means of turbines and generators, an electric current representing 25,000 H. P. This can be doubled if desired.

Another enterprise of a similar nature is now being built for the Cia. Anonima de Transmision Electrica de Potencia, about 100 miles north of the City of Mexico, in the province of Hidalgo. The head used in this case will be 800 ft., the water being carried downward to the power house, from the terminus of the canal, through a 1,700-ft. 30-in. pipe line. The water is taken from the Arroyo de Regla, a stream whose minimum supply per minute is 1,500 cu. ft. The water is carried from a natural reservoir which this river forms in the mountains, through a canal $1\frac{1}{2}$ miles long, having along its line seven tunnels, aggregating 1,200 ft. of solid rock cutting.

The water power is utilized by means of five Pelton wheels, 40 in. in diameter, and of 400 H. P. each. These wheels are connected by laterals to a receiver, 75 ft. long and 40 in. in diameter, which forms the terminus of the pipe line. This reservoir is of $\frac{3}{4}$ -in. steel plates, tested to a pressure of 700 lbs.

Each of the Pelton wheels is direct connected to a 12-pole, three-phase generator, running at a speed of 600 revolutions per minute, and generating a current of 700 volts pressure. In addition, two 24-in. Pelton wheels are provided, which run the exciters. Their speed is 1,700 revolutions per minute.

The step-up transformers are wound for a ratio of 1 to 15, which causes the current to be delivered at a voltage of 10,000 at the generator end of the line.

The mines of the Rio del Monte company, which will be supplied with power from this plant, are situated within a radius of 20 miles of the generating station, the mean distance of transmission being about 18 miles. In addition, the City of Pachuca will be furnished with light, and other mines will also be supplied with power. The company first mentioned employs, alone, over 8,000 men, being one of the largest concerns of the kind in the world.

The Thomson-Houston International Co., which is a department of the General Electric Co., and which does the business of that company outside of the United States, has the contract for the installation of the electric machinery.

Malleable Iron Carline and Sill Pockets.

In the framing of freight cars the strength of important members of the structure is reduced considerably by the material which must be removed for mortises and tenons. This method of framing also makes it difficult to remove any single member of the car frame for repairs. These objectionable features are avoided by the malleable iron carline and sill pockets, which the National Malleable Castings Company is making under patents controlled by Mr. W. E. Coffin, of Marshall, Tex. A number of these pockets are shown in Fig. 1 of the accompanying illustration, the lower view showing several of them of different sizes attached to a side plate and with the ends of the carlines in place; the intermediate view shows the same pockets with the carlines removed, and the upper view shows the plate and carline ends drilled and ready to be put together. In Fig. 2 are shown pieces of freight car plates and carlines, which illustrate in a striking manner the way in which the parts are weakened by the present method of framing.

The advantages of these carline and sill pockets may be summed up as follows: They save the time and expense of mortising and tenoning timbers and also reduce the cost of erecting the frame work of a car, further the sills and plates are not weakened as in the present construction. The time required in renewing end or side plates, carlines, or sills, is greatly reduced, as by remov-

ing the bolts which hold the carline or sill pocket a timber can be removed without spreading the frame or disturbing the adjacent parts. These pockets are made in all sizes and shapes by the National Malleable Castings Company, the railroad department of which is at the Old Colony Building, Chicago.

The Chesapeake & Ohio Canal.

In 1893 the Chesapeake & Ohio Canal carried 340,000 tons of coal, which, at the rate of 30 cents a ton, yielded a fair revenue. In 1894 business was slack, but brightened

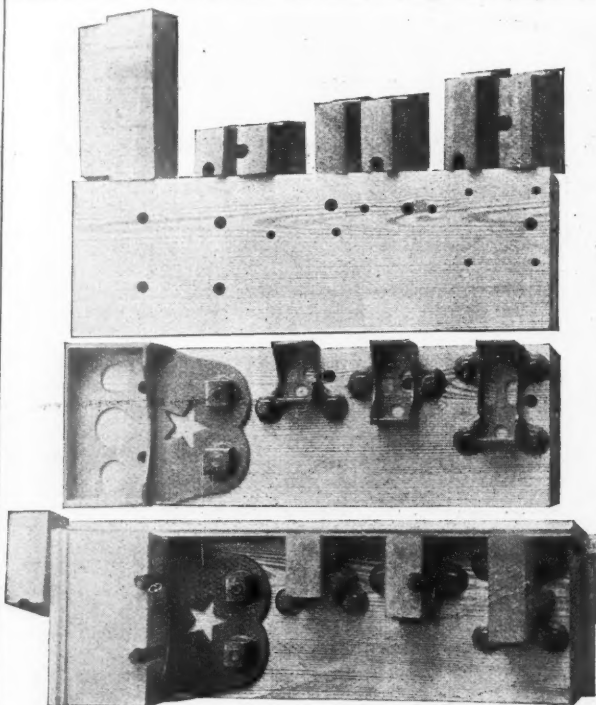


Fig. 1.—Carline and Sill Pockets, National Malleable Casting Co.

up toward the close of the season, with prospects of a large tonnage in 1895. Preparations were made during the winter to enlarge the carrying capacity of the canal, and navigation opened in March with the departure of 40 barges from Cumberland and Wilmington. After three weeks of activity business came to a sudden halt, and shows no sign of revival. On the contrary, there are indications that traffic on the canal for the summer will be very light, several boats having already "tied up" and shippers being discouraged. Several causes have been assigned, such as imperfect arrangements for handling coal at the Georgetown terminal, lack of vessels to carry it down the Potomac, and unfavorable market conditions. But the chief reason is that West Virginia coal is taking the place of the Maryland product in market, owing to competitive rates by the railroads.

For the year ending April 30, 1894, 976,724 tons of bituminous coal were shipped from Cumberland. Of this amount 559,346 tons passed over the Baltimore & Ohio. The Pennsylvania Railroad carried 380,948 tons, and the canal carried 36,436 tons. These figures, however, cover the period of the closed season for the canal, which in the Winter of 1893-94 was nearly three months. The proportion of traffic passing over these three lines of transportation under ordinary circumstances is about 5, 3 and 2, respectively.

The capital stock of the Chesapeake & Ohio Canal Co., is \$3,851,593, of which \$1,000,000 belongs to the United States Government, \$2,000,000 to the State of Maryland, and \$851,000 represents private investments in the original enterprise. In addition the State of Maryland holds a mortgage of \$4,375,000, and another of \$2,000,000 against the property. The original sums expended in constructing the canal and equipping it for business were not sufficient to complete the line to Cumberland. Accordingly, in 1844, the Maryland Legislature authorized a loan of \$1,700,000 upon the property of the canal, waiving its priority of right in favor of the bonds which were to be issued to cover the loan. These bonds were negotiated, and, with accrued interest amounting to nearly \$4,500,000, constitute the famous claims of the bondholders of 1844. The holdings now are principally in the hands of Miss Mary Garrett, of Baltimore, and a few other capitalists also largely represented in the Baltimore & Ohio Railroad.

In 1890 the Cumberland & Washington Railroad Company, backed by the West Virginia Central Railroad Company, applied for a lease of the title, property and right of way of the Chesapeake & Ohio Canal Company. Special acts of the Maryland Legislature, passed Feb. 28 and March 27 in that year, granted this lease, and also waived the prior claims of the State on consideration of \$1,400,000 to be paid at the consummation of the contract, and an annuity of \$15,000. As the lease was about

to be executed, the bondholders of 1844 secured an injunction against the sale of the canal, asking permission to control it temporarily in order to ascertain whether it could be operated profitably, with a view to paying off the principal and interest of their holdings. At that time the canal was in a moribund condition, having been damaged badly in the floods of 1889. It became necessary, therefore, for the holders of the bonds of 1844 to repair the canal and assume the payment of a series of repair bonds issued in 1878 amounting to \$600,000. The injunction was granted, and the new management was given until May 1, 1891, to put the canal in operation. One of the conditions of the decree also was that proof should be shown before May 1, 1895, that the canal could be operated at a profit, and that there would be a reasonable prospect of paying off the accumulated indebtedness.

Operations last year and at the opening of the season last March furnished ground for the hope that the business of the canal would warrant an extension of time to the present management, but the Cumberland & Washington Railroad Company practically holds a lease on the property, which will put that corporation in possession of the canal if the fact is demonstrated that it will not pay. It is hinted, therefore, that the present slump in traffic has been brought about by the competing railroads to destroy business on the canal, with a view of suspending the decree of the court and getting possession of the property for railroad purposes. This of course, will be opposed by the Baltimore & Ohio Railroad Company, and when the matter comes to a crisis interesting developments may be expected.

The history of this famous waterway does not warrant confidence in its rejuvenation or its retention as a separate means of transportation. The Maryland Legislature was convinced in 1890 that it was useless to spend more money on an enterprise that already had involved \$27,000,000 in principal, interest, and outstanding claims for labor, and that the wisest thing to do was to sell it for the roadbed of a line of railroad. Subsequent experience has not changed the wisdom of that view.

The San Joaquin Valley Railroad.

In recent issues of the *Railroad Gazette* appeared an article on the railroad situation in California. The most recent expression of the public hostility to the existing railroad system in California has taken form in the following pledge, which people are asked to fill up, sign and return to a San Francisco newspaper:

For the purpose of giving not only moral but substantial aid to the San Francisco & San Joaquin Valley Railway, I hereby agree, rates and facilities being equal, to patronize the passenger service and forward over the said road all freight I may have for transportation.

I will probably ship..... tons per annum.

Name.....

Address.....

The stand taken by the signers of this pledge is almost precisely the same as that taken 15 years ago by those merchants who made special contracts with the Central Pacific Company to the effect that they would not ship any freight by water, either export or import. In exchange for this concession the railroads offered lower

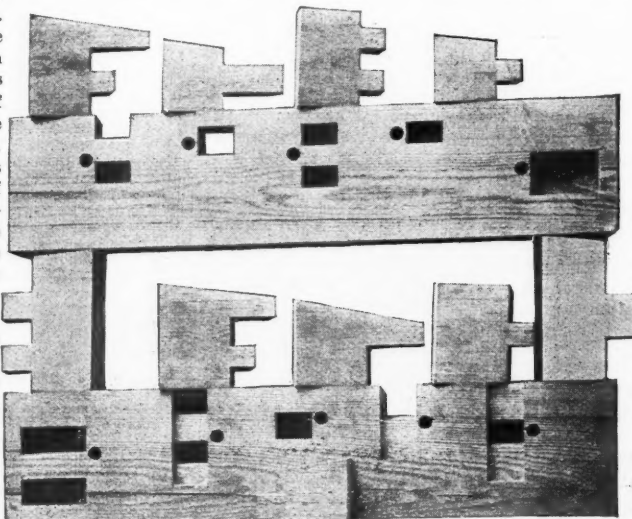


Fig. 2.—Portions of Carlines and Plates, Showing Weakening of Timbers by Mortising.

rates. For years these special contract days have been referred to as a time of tyranny and unjust discrimination by a "soulless corporation." Whenever the press has been in want of a charge to prefer against the "one railroad of California" the special contracts have been revived and denounced. But now the press and the people seem to think that it is a good plan to fight the devil with fire.

The shareholders in the new road are making careful

arrangements to prevent the consolidation or the pooling of the business of the new road with the old ones. They have chosen a board of trustees, with whom they deposit their stock and receive in exchange trust certificates. All the voting is to be done by the board of six trustees who, in the terms of the agreement, "shall be ineligible to hold any position or office of profit, or as directors or otherwise, in the San Joaquin Valley Railway Company; and said trustees shall not at any time furnish any supplies to said corporation, or be interested directly or indirectly in any contract of the said corporation, other than as trustees, and shall act as such trustees without compensation." The trustees are to have the disbursement of the dividends and agree not to vote the stock in favor of any person having interest in any other railroad in the San Joaquin Valley; and further, the trustees agree "that the said road shall not be leased to nor consolidated with any company which may own, control, manage or operate any of the roads now existing in the San Joaquin Valley, and the trustees shall not, nor shall their successors have any power as stockholders to assent to any such consolidation or lease, or in any way to put the said road under the same management as that of any other railroad now existing in the San Joaquin Valley." The trust is to continue in effect for ten years, and all stock sold in the future is to be issued subject to the agreement entered into between the present trustees and the present body of shareholders. There is a provision, however, that the agreement can be abrogated at a meeting of the holders of trust certificates whose certificates represent 75 per cent. of the stock.

Car Accountants' Convention.

The 20th annual meeting of the International Association of Car Accountants was reported in the *Railroad Gazette* of May 3, but Mr. Church's paper was crowded out and appears in another column of this issue.

The report of the committee on office methods and accounting recommended six forms for blanks, the headings of the columns of which we reproduce herewith. These blanks were designed by the committee after a careful study of the forms in use on many roads in the United States and Canada, on which there was found to be a great variety of methods. The report of the committee gives the headings of the blanks, with some idea of the size, but as there was no decisive action, the subject being put over to the next meeting, we have not deemed it worth while to make a study of the forms as a whole; the headings of the columns, as reproduced, show the essential ideas of the committee.

Forms A1 and A2, station interchange reports, are to be printed on opposite sides of the same sheet, A1 being for your own cars and A2 for foreign cars. In these and other forms which provide for seal records, A indicates the door on the right hand side of the car, looking back from the engine; B, the left hand door; C, the front end door; D, the rear end door.

Form B is the daily junction card. Form C is the interchange ledger. The committee recommends that the ledger shall be made large enough to show five of these forms on a leaf, so that a book lying open will show ten forms; with this arrangement an office doing a large business can classify the numbers from 0 to 9, and thus use the columns as indexes.

Form D is the station daily car report. The feature of this is the entering of numbers in such a way that a car received and forwarded the same day need be entered only once.

Form E is the office record of foreign cars, and can be increased in size where desired. The committee recom-

mends that mileage be figured from the records direct and not from conductors' reports.

It will be noticed that form B provides for showing either per diem or mileage earnings. The committee does not recommend reporting mileage on cars in this way, but suggests the importance of using this form of card in case the per diem system should be adopted.

The Wolhaupter Tie Plate.

A form of tie plate embodying some novel features is shown in the illustrations, Figs. 1 and 2. Fig. 1 shows the tie plate in position on the tie and carrying the rail. Fig. 2 is a cross section of the plate. As will be seen, the metal is so disposed as to form

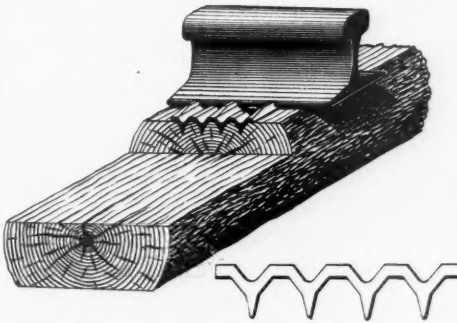


Fig. 1.

Fig. 2.

The Wolhaupter Tie Plate.

a series of arches extending the entire length of the plate. This is clearly shown in the cross section. The walls of the arches form sharp edged flanges which enter the tie and compress its fibers. The base of the rail rests on the corrugated upper face of the plate. This plate is called an "arch and girder" tie plate, because while forming an arch one way it acts as a girder in the other. It is estimated to be stronger than most other tie plates and to hold more firmly in the tie. Further, the corrugated upper surface of the plate will, it is believed, prevent sand from collecting thereon and consequent wear of the plate. Each plate is provided with two spike holes, and, if desired, with outside shoulders which bear against the rail. These shoulders are shown in Fig. 1. Opinion being still divided as to their advantages, they are furnished or not, according to the wish of the purchaser. These plates are made by the Railroad Supply Co., whose office is in the Owings Building, Chicago.

RECEIVED FROM				CAR		DELIVERED TO				No. of Days or Miles
Road	Date	L or E	Initials	No.		Road	Date	L or E	Initials	

Form B.—Daily Junction Card.

Car No.	FROM		L or E	TO		L or E	No. days per item allowed or No. Miles Run			Card No.
	Date	Road		Date	Road		Jan.	Feb.	March	

Form C.—Interchange Ledger.

DELIVERED						RECEIVED					
Initial	Loaded Car Number	Empty Car Number or Contents of Loaded Car	Road Delivered To	Destination	Date and Time	Initial	Loaded Car Number	Empty Car Number or Contents of Loaded Car	Road Rec'd From	Destination	Date and Time

Form A1.—Station Interchange Report.

FOREIGN CARS RECEIVED FROM AND DELIVERED TO FOREIGN ROAD

At Station, From o'clock M. 189 To o'clock M. 189

INSTRUCTIONS.

All cars transferred, Passenger as well as Freight, must be reported. All numbers or names must be taken from the cars themselves and not from Way-Bills or other memoranda of any kind. In reporting cars received from Foreign Roads, show the number of Foreign Seals and immediately over then give their initials. When two or more Companies' Seals are found upon a car, give only those of the road from which the car is received. Should the car bear no seals of the road from which it is received, then give such seals as it bears, and should it bear none report "No seals." Ent. Fastenings on all sealed cars must be reported as seals on side doors. In reporting cars delivered to Foreign Roads, show local seals only.

RECEIVED						DELIVERED					
Initials	Loaded Car Number	Empty Car Number or Contents of Loaded Car	Date and Time	Road Received From	Destination, Use Station Number	Initials	Loaded Car Number	Empty Car Number or Contents of Loaded Car	Date and Time	Road Delivered to	Destination, Use Station Number

Form A2.—Station Interchange Report.

Make up the report as per headed columns, first placing cars remaining on hand at close of last report, entering LOCAL cars first, FOREIGN cars next. After completing list of cars remaining on hand as per check of yard, taken at close of last report, enter the cars RECEIVED by trains in their order of arrival, commencing with the car next to the engine and ending with caboose number, filling in the columns on left-hand side of blank. Then, when cars are FORWARDED, show disposition opposite each car as per columns on the right-hand side of blank. Cars received from CONNECTIONS this date will not appear on the "received" side of this report, but when such cars are forwarded, the car numbers and initials should be entered and disposition shown the same as other cars forwarded. Mail to Car Service Department by first Passenger Train after close of report.

RECEIPT				CARS ON HAND FROM LAST REPORT				DISPOSITION OR WHY HELD			
SEAL RECORD RECEIVED				CARS RECEIVED AND FORWARDED THIS DATE				SEAL RECORD FORWARDED			

Form D.—Station Daily Car Report.

										RECEIVED			Transfer	DELIVERED		MOVEMENTS															No. of Days or Miles			Junction Card No.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
1	2	3	4	5	6	7	8	9	0	FROM AT	Date	Dest'n		TO AT	Date	January					February					March					Jan.	Feb.	March																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										

Second last figure in the index. Each column to be spaced for five figures.

Form E.—Foreign Record.

Proposed Forms of Car Service Blanks.



ESTABLISHED IN APRIL, 1856.

Published Every Friday

At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisement.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

At the monthly "engineering evening" of the American Society of Mechanical Engineers, held last Wednesday, Mr. F. W. Dean opened the discussion on compound locomotives with an excellent paper. The publication of this paper we withhold in order that it may be accompanied by a report of the valuable discussion. Mr. Dean starts out with the fundamental proposition that a compound locomotive properly designed will save steam compared with the best simple locomotive, no matter what kind of service is considered. He goes on then to demonstrate this proposition, taking up first the elements of economy, then the elements of loss. His discussion is remarkably clear and his conclusions are that a compound of the automatic type will show economy over a simple locomotive in the following order: Elevated railroad service, suburban service, freight service, express passenger service. The fact that there seems to be now a reaction against the compound he attributes to "experience with locomotives having such bad qualities that their use was simply intolerable."

One of the great western railroads has very recently issued the following special order which was the result of damaged track caused by an imperfectly balanced engine running over it. The damage was very great and necessitated extensive repairs, the results of imperfect balancing being shown in a more marked degree even than in those instances which were illustrated in the *Railroad Gazette* of Aug. 24, 1894. The order reads: "Consolidation engines will not hereafter be permitted to run at a rate of speed exceeding 30 miles per hour in any branch of service. Engines running on one side, or without parallel rods, must not exceed 20 miles per hour. Trains hauling dead engines, disconnected, must not exceed 20 miles per hour. Engines operating upon branches or in yard service distant from shops, must not be ordered over the main line to the shops for repairs until a representative of the Locomotive and Car Department has examined them and reported that they are safe to be moved. In making such examination, particular attention must be given to the inspection of the tires. An engine with a flat tire must not be run over the road under any circumstances. When yard engines are moved outside of yard limits, they will in no case be allowed to exceed 15 miles per hour. The object of the foregoing regulations is to prevent damage to track arising from locomotives imperfectly balanced or having defective wheels. Superintendents will see that this order is strictly enforced." We give this as an important addition to the discussion of the counter-balance question; but it would be immensely more important and interesting if we could tell the particulars of the case which called it out.

In the annual report of the Chicago & Grand Trunk, lately issued, General Manager Spicer lays great stress upon the diversion of business from Chicago by reason of inequality of freight rates through lower Mississippi River gateways, and also upon the large growth

of export traffic by way of Newport News, as having contributed materially to bring about the great deficiency on the Chicago & Grand Trunk in the year 1894, which was much worse than that for 1893. Frequent mention has been made in these columns of the influence of the Newport News gateway on eastbound traffic, but we believe that this is the first time that attention has been called to actual figures. The decided stand which has been taken by President Ingalls, of the Chesapeake & Ohio, regarding the Newport News route, has undoubtedly had much to do with the disturbances of rates from Chicago, for the Chicago lines have been exceedingly reluctant to concede the importance of the Newport News route, and have attempted to "equalize" rates by manipulations rather than admit the necessity of openly meeting the Newport News competition. Mr. Spicer presents the following statistics for five years:

Exports from Newport News.

	Flour, barrels.	Wheat, bushels.	Corn, bu. hls.
1889.....	39,365	15,077	716,947
1890.....	132,795	270,952	519,232
1891.....	791,687	1,822,717	511,677
1892.....	451,935	1,359,053	629,746
1893.....	685,792	1,875,282	1,893,349
1894.....	646,751	2,351,500	4,838,759

The wheat and corn thus exported in 1894 equals over 200,000 tons, or, say, 8,000 carloads of 25 tons each; and about 92,500 tons, or 3,700 cars, more than in 1893. Not all of this grain was taken away from Chicago, of course, but the Chicago men cannot help making comparisons. Those 3,700 cars carried an average of 1,788 tons weekly, which was probably equal to 10 to 25 per cent. of the amount of grain carried out of Chicago weekly by the railroads. Whether the Chesapeake & Ohio added much to its wealth by carrying this grain, is another story—but whether it did or did not Mr. Spicer probably finds very little comfort in the fact.

The harmful practice, not to say the vice, of making carload rates that have little or no relation to the size of the cars, has been referred to in these columns several times, notably on Feb. 1, page 70, and Feb. 8, page 79. In a paper read at the San Francisco Convention, Mr. S. H. Church has reminded the car accountants of their duty to use their influence toward restricting reckless competition in freight rates by the use of extra large cars. This paper, pointing out the evils incident to the use of furniture cars, is printed in another column.

We are bound to say, however, as was said in the articles referred to, that the traffic department ought not only to take the lead in the enforcement of business-like methods in this matter, but to put the reform through without delay. Mr. Church was too polite to tell the traffic men how unscientific and wasteful they are in this matter, but evidently he has done a lot of thinking on the subject. When it was decided to charge for 20,000 lbs. on a car load of machinery that would weigh only 10,000, the rate was made on the assumption that the price ought to be twice as high as for 10,000 lbs. of goods only half as bulky. It was not with a view to inducing the shipper to put another 10,000 lbs. on the roof or to get around the tariff in any way. But in the course of modern evolution the freight agent himself has taught the shipper how to cheat the road, and, indeed, helps him do it. It is no more fair to carry 2,500 cu. ft. of freight at a price that was fixed for 1,500 cu. ft. than to carry 40-ft. telegraph poles on a 30-ft. car (furnishing an empty car to run under the projecting ends) at the regular car-load rate for 30-ft. cars. The normal method of curing the existing evil would be to increase the rate according to the increase in the cubic capacity of the cars, but as any increase is very hard to accomplish, however good the grounds for it, a decrease in the rates for ordinary cars is the only alternative. One or the other is necessary: as necessary as the stopping of any other rate-cutting. There is a danger, from the operating officers' standpoint, in the indiscriminate use of very large cars for all sorts of commodities; they will be used for heavier and heavier goods and after a while will be overloaded and break down. Unscrupulous shippers will not care and agents will take the risk.

The Erie Canal is now open, but not a single boat load of grain had been started from Buffalo at last accounts. The extreme dullness in eastbound grain traffic has led the railroads to reduce their rates from Buffalo to the seaboard to such a low point that quotations have gone below 3 cents a bushel, which, the boatmen say, is as low as corn or wheat can be carried by water without loss. The New York Central and the Erie are accused of taking most of the grain that has reached Buffalo by lake this season; and the boatmen say that wheat has been taken as low as 2½ cents a bushel, which is equal to 3.96 cents per 100 lbs., or 1.8 mills per ton per mile. It is needless to say that the railroads would not take freight at this rate if they did not have large facilities lying idle.

When, however, the manager finds himself with hundreds of empty cars standing on side tracks with idle enginemen and conductors whom he hates to discharge, with a costly elevator in New York, eating itself up, and perhaps with an interest in a lot of lighters in the harbor, he is quite likely to decide that he can afford to take freight at rates which make the averages of the Interstate Commerce Commission look as extravagant as an English freight rate. But we must not hastily assume that the railroads are carrying this grain at less than cost. The New York Central is 440 miles long. A train of sixty cars, each carrying 30 tons, contains 1,800 tons which, at the above-mentioned rate, brings in \$1,425; or \$3.24 per train mile, which is just about twice the average receipt per train mile for freight, throughout the country, as computed by the statistician of the Interstate Commerce Commission.

This radical reduction of rates by the railroads between Buffalo and New York marks the dissolution of the agreement, which was maintained by the railroads during the navigation seasons of 1893 and 1894, to enforce a uniform rate on grain and to divide the traffic between them according to agreed percentages. This agreement is understood to have worked very smoothly, the joint agent at the New York Produce Exchange having been able to divert traffic, when necessary, to the losing road or roads without inconveniencing the shippers. But a good deal of grain goes to Philadelphia, Baltimore and Boston, and this was not taken into account in making the division; this naturally proved a source of irritation to the roads which could carry to New York only and seems to have been the final cause of the disruption of the agreement. While the rate to New York was strictly maintained (at 5 cents a bushel most of the time) the rates to the other places might be and often were reduced to any extent necessary to take a good share of the grain. It is to be noted that traffic from New York to Buffalo is not interstate and therefore not subject to the national "Act to regulate commerce;" the roads therefore have been free to adjust rates in any way they pleased. The line of the Pennsylvania, from Erie to Philadelphia, which at times has taken a good deal of the grain coming from Chicago by lake, is also wholly within one state.

Mr. Goodnow, Superintendent of the Chicago, Milwaukee & St. Paul, at Marion, Ia., whose interesting account of the use of the block system on the single track lines of that road was published in the *Railroad Gazette* of March 19, and who was the first American superintendent to use electrically interlocked apparatus for operating the staff system, made some further statements at the last meeting of the Western Railway Club which will be of particular interest to every superintendent of a single track railroad. His experience with the Webb & Thompson staff apparatus has convinced him that with this instrument trains actually can be handled on a busy single-track road with considerably less delay than by the use of ordinary train orders, under the usual American system. Mr. Goodnow is a skillful train dispatcher of long experience and his views corresponding weight should be given. His remarks at Chicago are printed in another column of this paper. It will be observed that he holds that, with the use of this apparatus, the time necessary to change a meeting point is reduced from 5, 8 or 10 minutes to practically nothing, and, as he says, this really increases the capacity of a railroad. A loss of 5 minutes often means an hour wasted. The only serious obstacle to the immediate introduction of this change is the cost of the apparatus. In view of the thousands of miles of single track railroad in this country, making an immense field, with which Great Britain and Australia combined are small in comparison, it would seem to be to the interest of the manufacturers to make the price of their instruments as low as possible. As was said by Mr. Sperry at the Chicago meeting, anything which will save time at meeting points will in many cases postpone for a considerable time the need of a second main track, costing \$10,000 to \$30,000 a mile. To postpone such an outlay even a year is an appreciable saving. A staff apparatus would pay for itself in a very short time and the manufacturers will please not understand us as recommending a sacrifice of reasonable profit on instruments sold to a railroad in that situation!

Although the strength of Mr. Goodnow's statements is evident on their face it may not be amiss to remind those who are not acquainted with him that he is peculiarly qualified to form a sound opinion in this matter, for the reason that he has had thorough personal experience with all the best methods of operating single track railroads. He was dispatcher on the Hoosac Tunnel (Troy & Greenfield) Railroad when

the business was heavy (so heavy as to demand an additional main track soon after), and there used the plain "American" system; on the Chicago, Milwaukee & St. Paul he has used this system, supplemented by the strict space interval (station to station), managed by the station telegraph operators; and at the Savanna Bridge he has used the electric staff. It will be noted that his confidence in the safety of his recommendation is based on the fact that possible mistakes of dispatchers or operators are prevented by mechanical means—the interlocking of the staff mechanisms at the opposite ends of the block section. The saving of time is in the avoidance of repetition, and of strict methodical procedure, in sending the telegraphic orders to the trains; and it is safe to neglect these precautions because the staff makes a perfect block system. Theoretically, the simple telegraphic block system, as now used on many roads, would also provide this safety, but as that demands the attention and care of the same persons (the station operators), who must receive and deliver the dispatcher's telegrams, conveying instructions about meeting points, the dispatcher cannot feel the necessary confidence that the operator will not confuse the two duties and make a dangerous mistake.

The Lake Shore and the Michigan Central.

The annual reports of the Lake Shore & Michigan Southern and of the Michigan Central railroads are of especial interest this year. They show well how two conservative companies, serving a rich country, and lying on a long line of heavy traffic, have met a prolonged period of deep financial depression. They show, too, as a matter of minor interest, the important effect of the special traffic of the World's Fair year on the results of the operation of the properties. To make some comparison of results on the two roads, we have prepared the two tables which follow. These show the earnings and expenses for 1894, and compare the various main items with each of the four preceding years by the method of percentage of change.

LAKE SHORE—RESULTS FOR 1894.

	1894.	Percent of change from—			
	1894.	1893.	1892.	1891.	1890.
Earnings: Freight	\$12,844,275	-11.36	-13.54	-7.56	-6.69
Pass'g'r.	4,420,642	-36.78	-17.98	-17.83	-12.63
Other...	2,292,953	+4.10	....	....	....
Total	\$19,557,870	-17.43	-12.75	-8.72	-6.32
Working expenses and taxes.....	13,186,067	-23.00	-16.65	-9.98	-7.38
Net earnings.....	\$6,371,803	-2.90	-3.63	-6.32	-4.21
Percent of expenses and taxes to earnings.....	67.42	72.29	70.50	68.27	68.15

MICHIGAN CENTRAL—RESULTS FOR 1894.

	1894.	Percent of change from—			
	1894.	1893.	1892.	1891.	1890.
Earnings: Freight	\$8,314,026	-9.87	-21.60	-15.89	-10.74
Pass'g'r.	3,493,341	-42.34	-22.22	-23.07	-21.52
Other...	770,645	....	....	....	....
Total	\$12,581,013	-22.25	-20.87	-17.01	-13.18
Working expenses and taxes.....	9,144,108	-25.63	-24.15	-17.73	-14.81
Net earnings,	\$3,436,905	-11.56	-10.88	-15.27	-8.52
Percentage of expenses and taxes to earnings.....	72.66	75.95	75.72	71.21	71.96

Taking up first the Lake Shore table. The freight earnings there were in 1894, 65.67 per cent. of all earnings; in 1893 they were 61.18 per cent., the abnormal increase of the passenger earnings having made the freight earnings relatively less. In an average year the percentage of freight earnings would be about 66. On the other hand the passenger earnings were, in 1894, 22.6 per cent. of all; the normal is about 24 per cent., but in 1893 they rose to 29.5 per cent. On the Michigan Central the freight earnings in 1894 were 65 per cent. of all, the normal being about 65.5 per cent., and in 1893 they fell to 56.9. The passenger earnings in 1894 were 27.8; the normal is about 29, and in 1893 they rose to 37.5. All of this illustrates the abnormal increase of passenger revenue in 1893, an increase which was due simply to the volume of traffic and not to rates, which must be kept in mind in considering these tables.

It will be observed that the revenue from freight traffic in 1894 was 11.36 per cent. less on the Lake Shore than in 1893, but 1893 was a bad year, and the 1894 revenue was 13.54 per cent. less than in 1892. In fact the revenue from freight on the Lake Shore has not been as small as it was last year since 1889, and in 1881 it was almost as large.

On the Michigan Central the freight revenue fell 9.87 per cent. from 1893, and 21.6 per cent. from 1892. We must go back to 1886 to find a year of such small earnings.

The passenger revenue shows a startling decline as compared with 1893, being 36.78 per cent. on the Lake Shore and 42.34 on the Michigan Central. While these decreases were abnormal, those from each of the three years preceding 1893 were very serious. In fact the Lake Shore has not had so slim a passenger revenue since 1886, and the Michigan Central must go back to 1885 to find passenger earnings so bad. On

both these roads the passenger business in recent years has suffered materially more than the freight.

In seeking the cause of the diminished gross revenue we find the ton-miles on both roads to have been as below, the table showing millions of ton-miles (that is, omitting the last three ciphers) for 1894, and the percentage of the change from each of the four years preceding:

Ton-miles in Millions and Percentage of Increase or Decrease.

	Million-ton miles.	Percentage of change from—			
	1894.	1893.	1892.	1891.	1890.
Lake Shore.....	2.196	-9.6	-9.8	+1.2	+1.8
Michigan Central.....	1.210	-10.8	-22.0	-11.6	-9.7

The ton-miles on the Lake Shore were less than in 1893 or 1892, but more than in any year preceding those. On the Michigan Central we must go back to 1889 to get a ton-mileage so low. The rates per ton-mile on each road, in fractions of a cent, were as below:

Rates per ton-mile, cents.

	1894.	1893.	1892.	1891.	1890.
Lake Shore.....	0.572	0.587	0.599	0.628	0.616
Michigan Central.....	0.687	0.680	0.684	0.722	0.695

The rate on the Lake Shore was the lowest ever recorded, except in 1885, when it fell to 0.553 cent. The Michigan Central rate has been lower in several years, as, for instance, in 1892 and 1893, as shown in the table above, and also in 1884 when it was 0.646; 1885, 0.560 and 1886, 0.686. We see therefore that low rates and small volume of business conspire to make the low gross freight earnings on both lines, and we see further that both of these elements have been acting for a series of years.

The passenger-miles and the changes, as compared with previous years, are as below, the passenger miles being in millions, and the changes from previous years being expressed in the ratio which the falling off in volume bore to the total volume in each of those years, expressed as a percentage:

Passenger-Miles in Millions and Percentage of Decrease.

	Pas'g'r miles.	Percentage of change from—			
	1894.	1893.	1892.	1891.	1890.
Lake Shore	193	-40.72	-20.18	-19.59	-12.00
Michigan Central.....	155	-45.73	-23.61	-23.26	-20.92

The rates per passenger per mile were, in cents, as below. It will be observed that for the years shown the change is not unfavorable, and in fact going back through a long series of years we find that the passenger rate has not fallen. The loss in passenger revenue therefore, is due to the diminished volume alone.

Rate per passenger mile, cents.

	1894.	1893.	1892.	1891.	1890.
Lake Shore.....	2.229	2.092	2.175	2.177	2.245
Michigan Central.....	2.258	2.123	2.211	2.249	2.276

The ton-miles of freight on the Lake Shore, eastbound, were 1,343,013,045, and westbound they were 853,231,523. The eastbound freight fell off 5.97 per cent., the westbound 14.62, and the whole, as we have shown above, 9.6, in mileage. On the Michigan Central the ton miles, eastbound, were 336,379,800 and westbound, 185,165,545, not including local freight. The decreases here were 8.7 per cent eastbound, and 23.2 per cent. westbound.

The decrease in passenger miles on the Lake Shore was, as shown above, 40.7 per cent. The passenger miles, eastbound, were 99,448,548 and the decrease 41.1 per cent. Westbound passenger miles were almost precisely the same, that is, 98,843,717 and the decrease was 40.2 per cent. The decrease in local passenger mileage was 31.6 per cent. On the Michigan Central the eastbound passenger miles amounted to 17,314,911, a decrease from the preceding year of 71.4 per cent. The westbound passenger miles were 17,725,114 and the decrease was 68.3 per cent. These do not include local mileage, which, as with the freight, is not divided in the report. The decrease in local passenger mileage on that system was 29 per cent. On both of these systems the local business, both freight and passenger, is very important. On the Lake Shore the passenger earnings in 1894 were nearly \$859,000 from through passengers and about \$3,562,000 from way passengers. On the Michigan Central the earnings from through passengers were a little less than \$671,000 and from local passengers about \$2,829,000. The local freight earnings were, on the Michigan Central, about 67.4 per cent. of the whole; on the Lake Shore they are not given separately. These figures enable one to see where the principal losses have been and the immediate causes; that is, decreased volume of business and decreased rate in the freight traffic and decreased volume with pretty stable rates in the passenger traffic.

We will turn now to the operating expenses. These are given below in tabular form for both systems, the decreases from preceding years being in percentages.

Operating expenses and taxes and percentage of decrease.

	Op. exp.	Decrease, percentage, from—			
	1894.	1893.	1892.	1891.	1890.
Lake Shore.....	\$13,186,068	-23.	-17	-10	-7.
Michigan Central.....	9,144,108	-25.5	-24	-18	-15.

The saving in operating expenses runs all the way through the large items. Indeed there are few items in which increases are found. On the Lake Shore, for instance, repairs of roadway were diminished nearly

\$900,000, repairs of locomotives over \$50,000. No new passenger cars appear for the year, making a difference of about \$615,000 as compared with 1893. The difference in purchases of new freight cars amounts to over \$900,000, the purchases last year having been but \$118,000. Of course in conducting transportation, the effect of smaller volume of business is seen in nearly all of the items.

On the Michigan Central there is a decrease of \$360,000 in repairs of roadway and of \$250,000 in repairs of bridges and buildings. The decrease in repairs of locomotives amounts to \$526,000; passenger cars \$144,000; freight cars \$398,000. In this statement too we find that the item of injuries to persons has fallen from \$286,000 in 1893 to \$62,000 in 1894. Presumably, however, this does not represent the actual difference in injuries in the two years, as claims for such injuries are not always settled in the year in which they are made.

The Lake Shore system is able to make some very remarkable statements as to its assets and liabilities. For instance, the capital stock of the company has remained unchanged at 50 millions of dollars since 1871. The funded debt was reduced by purchase and cancellation of first mortgage bonds \$250,000. The total amount of bonds thus cancelled is six millions.

We have so recently described at great length the doings of this company in improvements of the property out of charges to operating expenses that it is unnecessary to go into that aspect of the report. Nothing has been charged to construction or equipment account since 1883.

On the Michigan Central the capital stock remains unchanged at \$18,738,204, and there has been no change in the funded debt since the last report, which now stands at \$18,376,000.

In 1893, in spite of the universal depression, the Lake Shore paid six per cent. on the common stock and the Michigan Central paid four.

Duty of Railroads to Ice Perishable Freight.

The decision issued by the Interstate Commerce Commission on April 6 concerning freight rates on strawberries and vegetables from Charlestown, S. C., to New York, was reported in the *Railroad Gazette* of April 19. It is not of immediate interest, so far as concerns most of the points decided, for the railroad companies acceded to the principal demand of the complainants before the decision came out; but the order to change the rates on cabbages and potatoes and that requiring the railroad company to furnish the ice and reduce the price for it, are still of interest.

The first ground of complaint—that the Pennsylvania railroad company insisted on delivering perishable freight at Jersey City instead of carrying it across the river to New York—will be remembered by our readers as having caused a good deal of friction two years ago. The space on the New York side being cramped, the Pennsylvania decided to deliver this freight at Jersey City, and as, practically, the delivering station has to be the market place, buyers going there in order to save time, this compelled the dealers to make trips across the river. The railroad company urged that the New York quarters were too small and that as soon as the dealers got used to the Jersey City wharf they would like it, but the arguments had little effect and after a while the company had to restore the New York delivery. The vested interests, real or alleged, were so variable and so hard to deal with, and the possible competition of water lines from the South direct to New York had so much effect that the truck jobbers had their way. This was inevitable, under the circumstances, whether right or wrong.

The action of the Interstate Commerce Commission on this part of the question seems to be wholly perfunctory. After laboriously computing the cost of transportation through from the south and the cost of carrying the barrels and crates of vegetables across the river (on wagons loaded on ferryboats), it was decided that the rates to Jersey City ought to be about 1½ cents less, per barrel or crate, than to New York. As before stated, the shippers have now lost interest in this part of the question, but it would be interesting to know what satisfaction it was expected they would get out of a reduction of one per cent. on their freight bills. Again, the principle of group rates has been approved by the Commission in other places, and the case of two cities situated like New York and Jersey City is one where group rates are most naturally, and, indeed, inevitably, applied. To talk about the difference in cost as between a trip of 999 miles and one of 1,000 miles must seem to the complainants like a mockery. Their grievance was not the cost of getting their barrels across the river, but the time and inconvenience involved in getting themselves across. The essential question in this part of the case is whether the Pennsylvania Railroad, having long carried freight to New York City, has the right, under its charter, to discontinue such service at all. If it continues to run

its boats to the New York wharf, by what right can it discriminate as to what freight it shall carry to New York?

But the main feature of the decision is that concerning the management of the refrigerators. It appears that the charge for icing the refrigerator cars in which strawberries are carried is equal to two cents per quart of berries, and the commissioners hold that under the evidence $1\frac{1}{2}$ cents is as high as they can approve as a reasonable rate. In this connection the report says:

An adequate or suitable car equipment is in most cases something in addition to the naked cars or boxes themselves. Where a carrier undertakes to transport passengers, seats, water, ventilation and light are essential to the comfort, health and safety of the passengers; and are therefore necessary parts of an adequate car equipment for that class of traffic. So when carriers undertake to transport highly perishable traffic requiring refrigeration in transit, ice and the facilities for its transportation in connection with that traffic are incidental to, and inseparable from, the service of transportation itself. We are of the opinion, therefore, that the defendants as common carriers, are under the law charged with the duty of furnishing the ice necessary for the refrigeration of strawberries which they undertake to transport, that the expense thus incurred is a necessary element of the cost of the transportation of such traffic and the amount received or demanded therefor is a freight charge. Section 1 of the Act to Regulate Commerce exacts reasonableness in "all charges made for any service rendered or to be rendered in the transportation of passengers or property, or in connection therewith." The demand and receipt of an excessive sum for refrigeration is, in our opinion, an unreasonable charge within the meaning of the law and the defendants are in respect to such charge subject to its provisions. The defendants, in conformity with what we hold to be their legal obligation, do furnish the ice necessary for refrigeration, and the question in this case is simply, whether their charge therefor is in legal contemplation a charge for the reasonableness of which they can be held responsible under Section 1 of the Interstate Commerce Law.

This principle, no doubt, is bound to prevail. The railroads have held off and have tried in every way possible to escape the additional complication and responsibility involved in thus enlarging the variety of work to be performed in connection with freight transportation, but the progress of evolution is inevitable, and as long as similar non-essential service, such as the maintenance of dining cars, is performed voluntarily, and is coming into vogue more and more every year, it is to be expected that the course of the Commission and of the courts will constantly tend toward making the law agree with the facts.

Furnishing ice for perishable freight would seem to be no more a part of the work of a carrier than furnishing fodder for cattle, but as long as the difference between having it done by a railroad agent and by an outsider is little more than a matter of form, or of book-keeping, it is to be expected that the authorities will decide that it is a reasonable service to impose upon the railroad. In this case the Commissioners seem to think that the railroad company was trying to enjoy the advantages of the icing business while shirking its responsibilities.

The order requiring the rate on cabbages to be made one-quarter less than the rate on potatoes, refers to the rate per barrel, and not to the rate per 100 lbs. A barrel of cabbages weighs about 150 lbs, and one of potatoes weighs about 200, and the value of potatoes is greater. Moreover, it appears that from Norfolk cabbages are carried at about one-third less per barrel than potatoes. There is considerable discussion in the report about the relative value of the service, and the relative bulk, as affecting the rates that ought to be charged, but this Norfolk rate seems to have been the principal ground for ordering the change.

The fruit shippers of California have already noticed this decision, and assuming, of course, that it is good law, they intend to bring it to bear on the transcontinental railroads. They have been paying \$125 each for the use of refrigerator cars to Chicago, though the refrigerator companies have announced that there will be a reduction this year. As far as pears, peaches and apricots are concerned, the Southern Pacific offers this year to furnish ventilated cars, and to run them through in sufficiently quick time to obviate the necessity of using ice; but for cherries it is believed that ice will still be necessary.

The Anthracite Situation.

The only important developments in the anthracite coal trade of which there is definite public knowledge is the decision of the sales agents to co-operate in the matter of restriction for the month of May, and to agree to secure higher prices. The negotiations which lead up to these conclusions started about the middle of April, and were not concluded until May 2. Up to the date first mentioned coal trade conditions had become so complicated that all hope of a settlement of differences was abandoned by the majority of the interests, and at least two of the companies had virtually decided upon a policy of open warfare in order to bring the issue to a head. The Delaware & Hudson directors instructed their representative in the sales agents' association not to agree to prices or output. These instructions were written, and their existence was well known to other representatives. In

fact one or two had pledged their co-operation in such a policy. Coincident therewith was a notice given to competitors by the Jersey Central that during the rest of April it would not be bound by the agreement to restrict to 60 per cent. of the capacity, then in force.

But the change which had taken place in the attitude of the companies a week later was startling. There were an almost complete cessation of war talk, a suspension of hostilities which carried with it a continuation of the restriction and some little steadiness in prices. At the adjourned meeting the sales agents again tackled the subject of restriction. A proposition had been made at the previous session to limit the output during May to 70 per cent. of the capacity, the basis being the month of June. However, if this month did not show as great returns for any of the companies as some other months in 1894, they would be allowed to choose the maximum period. When this proposition again came up it was found that the Lehigh Valley, which had stood out because of the non-co-operation of the Pennsylvania Railroad, was satisfied with the answer which the operators of that company gave to the request for co-operation, and that the Reading company, whose attitude had been somewhat uncertain, agreed to the general proposition; it selected another month. Thus all interests were brought into line.

However, this was only for a short time, as it was discovered that on the basis of the month selected by Reading that company would produce 21 per cent. of the total, as against its proportionate share of 20.3 per cent., as established by its 1894 operations. This brought up the old 21 per cent. issue, and caused certain of the other interests to refuse to co-operate. Jersey Central and Lehigh Valley made the claim that June would not be a fair basis for them, as in that month their operations were enormously retarded by mine floods. The upshot was that the plan was replaced by one providing that all companies should mine but three consecutive days per week. On Friday of last week this proposition was ratified by order of the presidents of the coal companies. On the same day the sales agents agreed to restore the April circular as soon as practicable, and they also fixed Western prices. This circular, f. o. b. gross, for free-burning coals, is as follows: Broken, egg and chestnut, \$3.35; stove, \$3.50. It was made the last of March to govern April business and was never secured. In fact, prices dropped some 35 to 50 cents per ton below that standard, and have shown no improvement. Moreover, the companies have booked orders which will last through May at the lowest prices, thus rendering it certain that the circular prices cannot be obtained before June. However, it is hoped that its re-adoption will cut off new orders at the low figures and stimulate the movement of coal on old contracts, so as to clean them up. The new circular, if obtained in June, will be only from 20 to 35 cents below the June, 1894, prices. Moreover, it will mark a new precedent in the trade, as the tendency of prices in the early summer has always been downward and not upward.

Now the theory goes that there are causes which lie deep beneath the surface and which have brought order out of chaos. Some color is given to the very positive statements made and reiterated by Dow, Jones & Co., for a week or more, to the effect that a powerful combination of coal interests is being perfected. According to this story capitalists controlling the New York Central, Pennsylvania, Erie and Jersey Central, have combined to secure control, in the open market and by private purchase, of practically all the anthracite interests at all important. The Jersey Central people are believed to hold the balance of power in Lackawanna. The Vanderbilts are largely interested in Delaware & Hudson; Mr. J. Pierpont Morgan's power in Erie, as well as in Reading, and certain of the other companies, is well known. According to the authority quoted, these capitalists have pooled issues with the Pennsylvania. The latter is to control the Lehigh Valley; Reading will be operated in the interests of harmony, and for the benefit of senior security holders. The Susquehanna & Western is the subject of negotiations with the Delaware & Hudson. There may be much or little in this interesting report. But if taken with care it will serve to pass the time until the next one comes up.

The Bond Market for April.

The bond market for April was remarkable in its breadth and extent of advance; it was the most active of any month since December, 1890. The largest number of issues dealt in one day was 132, and for the week 282. Almost every day during the month some bond was quoted that had not been dealt in for from one to five years. Foreigners have taken hold of our railroad bonds in a manner which may indicate that they are making investments not for a turn, but as real investments. They are buying first and second-class securities and buying them in quantities. The Kafir mining speculation has about run its course, and those who made heavy profits are naturally seeking new and safer fields in which to turn their surplus.

There is probably little question that the bond syndicate has done much to start this buying. Shortly after the sale of Government bonds, exchange went to a point which rendered it necessary for them to sell bills at figures which at the time appeared to show a loss, in order to prevent exports of gold. It was but natural that their powerful influence should be used to whet the appetite of foreign capitalists for our securities in order

to turn the trade balance. Heavy purchases in the open market have been supplemented by sales of large blocks. It is believed that large amounts of Southern Railway five's, practically all the nine odd million Manhattan four's and some two million Minneapolis & St. Louis were sold in bulk in London and on the Continent. That the transactions have been heavy is shown by exchange, which dropped fully one cent in the posted rates in the two weeks ending May 5. This will enable drawers of exchange at the high figures to cover at a good profit.

We may hope that foreign buying has just started. Up to a recent time the tendency in this direction was checked at frequent intervals by fresh defaults, dividend reductions or passages, and by one or two receiverships. It is believed that the worst is now known, and that further developments in our railroad properties will be favorable rather than otherwise. The one great incentive which our bonds furnish foreigners is the fact that they are low, not having discounted expected improvement.

Locally, the demand springs from speculative buyers, as well as those who are seeking employment for idle money. This is the time of year that money is coming to New York from the interior. In the four weeks ending Saturday, the associated bank net deposits increased \$26,175,500. Confidence has sufficiently returned to warrant investments of these funds on a large scale. As is usual in sustained buying movements, a great deal of raffia is forced upon public attention. This accounts for the large number of almost forgotten issues which have been given a quotation of late.

In a general way it can be said that almost every bond at all active or important has shown advances. Some of the appreciations have been very sharp, despite which fact there has been little or no disposition to take profits. While the buying has been general it has also been specific as regards certain groups. Northern Pacific issues, for example, advanced from 8 to 13 points, the average being about $9\frac{1}{2}$ on buying believed to be for control of the property. It is associated in the public mind with Mr. Henry Villard's appearance in this country and the reported conflict between that capitalist and Mr. Adams, who is aiming toward a reorganization in the interest of the Deutsche Bank. Reading bonds were strong for the same reason that the coal stocks were strong, viz., a decided preponderance of buyers. Southwestern Railway issues, as was the case in March, were favorites. This is due to their low prices and the prospect of a material improvement as the country returns to a normal business basis. Colorado Midland four's advanced sharply on a separate receivership for that property. Other movements, almost without number, could be chronicled. But those cited are sufficient to give an idea of the market.

The issues which have led in activity, together with the volume of sales, par value, are given in the accompanying list:

Atchison 4's.....	\$3,659,000
Atchison 2d "A".....	3,025,000
Chesapeake & Ohio 1½'s.....	792,000
Chicago & Northern Pacific 5's.....	1,545,000
Kansas & Texas 4's.....	894,000
Kansas & Texas 2d's.....	1,478,000
Missouri, Kansas & Eastern 1st's.....	561,000
Missouri, Kansas & Texas 5's.....	407,000
Northern Pacific 1st's.....	255,000
Northern Pacific 1st reg.....	320,000
Northern Pacific 2d's.....	609,000
Northern Pacific 3d's.....	332,000
Northern Pacific con. 5's.....	3,327,000
Northern Pacific con. 5°, T. R. R.....	710,000
Northern Pacific Col. Trust notes.....	831,000
Reading gen. mort. T. R. R. notes.....	964,000
Reading 1st incomes.....	1,170,000
Reading 2d incomes.....	529,000
Reading 3d incomes.....	390,000
Rio Grande Western 4's.....	755,000
St. Louis Southwestern 1st's.....	587,000
St. Louis Southwestern 2d's.....	979,000
Southern Railway 5's.....	1,459,000
Texas & Pacific 1st's.....	318,000
Texas & Pacific 2d's.....	2,518,000
Union Pacific, Denver & Gulf 1st's.....	1,021,000
Wabash 1st's.....	383,000
Wabash 2d's.....	556,000
Western New York & Penn. 2d's.....	388,000

Total sales during the month amounted to \$49,958,950, an average of \$2,270,000 per day.

The shipper who will pay local rates part way to destination and then reconsign his freight is generally looked upon as a greenhorn to be pitied, but the traffic manager of the Atchison, Topeka & Santa Fe in Texas has encountered one who does this to make money, and he does it by some scheme which doubtless makes the railroad man wish that Section 7 of the Interstate Commerce law applied to shippers as well as to railroad companies. Mr. Long, of San Angelo, some 300 miles southwest of Fort Worth, had ten car loads of sheep that he wished to send to Fort Worth, and called for the cars to be ready for him April 12; but the station agent heard something that made him believe that the sheep were destined for Kansas City, and he therefore refused to accept them unless Mr. Long would agree in writing to pay the Santa Fe, for transportation to Fort Worth, its proportion of the through rate to Kansas City (which, it appears, is larger than the local rate), in case it turned out that the sheep were actually sent through. Mr. Long could not obtain men to drive his sheep to a competing railroad and therefore he shipped a train load at the railroad's terms; but he complained to the State Railroad Commissioners, who notified the general freight agent that the action of the local agent in exacting such a condition was in violation of the law. Chairman Reagan in this letter says: Any person has a right to make a shipment from one point to another in Texas and no railroad company has the right to demand his reason for so doing, or to impose any condition not prescribed by law or by some regulation of the Commis-

sion. The road replied that the device of shipping to Fort Worth was really a violation of the spirit of Section 7 of the Interstate Commerce law, being an unnecessary interruption of a through shipment in its journey from point of origin to the place of final destination. The agent offered to accept the local rate to Fort Worth, prescribed by the Commission, with no condition except the reservation of a right to pursue a certain line of action in a certain designated contingency, and this was not a violation of any rule or regulation of the Texas Commissioners. Mr. Polk, the writer of the letter, further stated that as the rate on sheep from Fort Worth to Kansas City was but 1 per cent. per 100 lbs. less than the rate from San Angelo to Kansas City, Long & Co., unless they were to receive some concession from the road beyond Fort Worth, would have paid for the privilege of diverting their shipment from the Santa Fe through line practically the whole amount charged from San Angelo to Fort Worth. As this was not a conceivable proposition, the only reasonable inference remaining was that there existed between Long & Co. and the road which they intended to favor beyond Fort Worth a combination or conspiracy for the purpose of depriving the Santa Fe of its just rights. This case is of interest chiefly as a curiosity, for it is not at all likely that the Atchison people can get any redress. Even without a secret rebate on the second road there would often be an advantage to a shipper in thus re-consigning, if local rates were to be less than the proportion of through rates, and such a condition were to be permanent and the fact become known. The proof of the rebate in this case is likely to be hard to get, and a readjustment of local rates, by the Texas commission, to make them correspond to interstate rates, is likely to be still harder. Section 7 of the Interstate Commerce law ought to apply to any one, carrier or shipper, who violates its spirit, but unfortunately the offense here dealt with belongs to a class hard to prove. It can hide behind legal technicalities until every one aggrieved dies of old age. Possibly the Interstate Commerce Commission would be willing to order the rate cutting road to reduce its tariff still lower than it was reduced for Mr. Long's secret benefit, on reasonable evidence that such a secret reduction was made; but that would harm the Atchison as much as it would the offender. Probably we ought to be thankful that intra-state and interstate rates do not clash oftener than they do.

While the dear public desires equity in railroad rates, as a general principle, nearly every one is willing to approve an exception when it will work to his individual benefit; and, as in other affairs of life, it is easy to convince one's self that the exception, after it is secured, is not really a violation of the principle. We have recently noted two illustrations of this. The carriage manufacturers of Philadelphia have formed an association, and have held a meeting to see what they could do to promote the interests of their trade; and, as might be expected, the first hardship to be aired is in connection with freight rates. To Boston and eastern points they find that they are paying very much more, in proportion to distance than they do to western points. Whether the Boston rates are too high and the others reasonable, or the Boston rates are reasonable and the others too low, does not enter into the discussion, of course. The fact that there are numerous empty cars moving westward, giving Philadelphians a chance to ship carriages to Chicago at rates below cost is not looked upon as a favor to be thankful for, but as one of the blessings to be naturally expected from living in a free country; and why should not a free country compel all its railroad servants to conform to a single cast-iron rule in this matter? Unfortunately, if we may judge by the past, these carriage makers will not need to go to a paternal government with their complaints; if they hammer long enough they will find some traffic manager who will reduce rates for them. As long as gross earnings continue to be the chief aim of so many railroad officers the shipper who wants to have balloons, inflated, classed in the tariff the same as lead, compressed, need not despair. The other instance was the decision of a committee of a cattle raisers' association in Texas to "push" their scheme to force the railroads to be more liberal with passes to shippers. They have not got acquainted with the Chicago cattle men for nothing, and they threaten to adopt the true Chicago method, of combining and turning all their shipments over to one road until they bring the other road or roads to terms. If, now, these Texas steers could be hitched to a Philadelphia buggy there is no reason why the combination team could not be driven right through all the non-pass-granting agreements in the country.

At the end of March last year there were 519 compound locomotives on the Prussian State Railroads. Privy Counsellor Stambke, one of the most experienced of the higher mechanical engineers in the service, states the results as follows in a recent paper read before the German Society of Mechanical Engineers: "All compound locomotives, under similar circumstances, when under full headway, develop a greater capacity than ordinary locomotives; at the same speed they exert greater traction, or with the same traction they make greater speed. They save fuel and water. On the other hand, ordinary locomotives have greater starting power than compounds, and, therefore, attain their standard rate of speed quicker. The time and space required for them to get under way is therefore less than with compounds, which latter, when stops are

frequent, often find it difficult to make up the time lost in starting. A compound locomotive which is arranged to use steam like any ordinary one in starting, can get under way as well as the latter. It is harder to start tight-coupled express and passenger trains than freight trains, and a failure of the draft rigging and a consequent lengthening of the time of getting under way, is therefore more to be feared with the former. The Prussian State Railroads have therefore come to the following conclusions:

- "1. Express locomotives hereafter are to be generally constructed on the compound system.
 - "2. In all tank locomotives and engines for branch roads the compound system is to be excluded.
 - "3. For freight engines used chiefly for long runs the compound system is to be employed.
 - "4. For freight engines used chiefly to serve among the coal districts, the compound system will be avoided for the present.
 - "5. For passenger engines with tenders, in view of the fact that they must make frequent stops, no decision is made yet. The experiments will be continued."
- The number of locomotives of the various types ordered for delivery this year was given by us last week, page 285.

The Congo Railroad was completed for 46 miles last November. About 25 miles have been in operation since February of last year, and the monthly earnings are amusing to one who has nothing invested in the enterprise. They were (the totals, not per mile):

March.	April.	May.	June.	July.	Aug.
\$98.	\$151.	\$941.	\$1,745.	\$1,188.	\$2,50.

The up traffic was nearly five times as great as the down. The passenger earnings were \$1,785 for the six months, \$1,021 of it from first-class passengers. The number of passengers carried was 109 first-class and 820 second-class, which is an average of 5 per day. The freight carried amounted to 401 tons, or 2½ tons per day—just a good wagon load. The road has not yet reached a point where a considerable traffic from the upper Congo can be reached, but the promoters say when it is open for 50 miles they are confident of earning as much as \$3,100 per mile per year. About 3,000 natives are employed on the work, but only 400 of them are Congo negroes.

The case against President Huntington, of the Southern Pacific, for granting a pass has fallen through, Judge Addison Brown, in the United States District Court at New York, having decided against the application of the California officers to take the accused into custody. In his decision Judge Brown said: "The application for removal must be denied, on the ground that the indictment is fatally defective in not averring that any use was ever made of the pass, or that any transportation was ever furnished under it. Where the indictment is bad in substance no removal will be granted. The various provisions of the act itself and the rulings and adjudications of the Inter-State Commerce Commission leave no doubt whatsoever that the act is intended to deal with transportation, and that nothing in the act makes criminal the mere issue of free tickets or passes that are never used."

The cloud compellers of the Rock Island appear not to have lost heart, notwithstanding the substantial failure of their efforts to make rain last year. Perhaps the disastrous failure of the corn crop in the great areas served by the Rock Island, and the consequent reduction of gross and net earnings have driven them to desperate remedies. At any rate, the newspapers tell us that the three cars which they fitted up last year with rain making apparatus are to be supplemented by three more this year, and that the experiments will be continued. It is astonishing that the company should waste good money in this way, for little as the cost of these experiments may be, it must be charged up at the end of the year as dead loss; and what is worse, it makes business for a lot of quacks, who will be encouraged to get money from the farmers for similar enterprises in other regions.

The Manhattan Elevated Railroad of New York City now runs 19 express trains between the lower part of the city and the 155th street terminus (on the west side) in addition to those which have been run for several years on the Ninth avenue line. The new trains run on the Sixth avenue line below Fifty-third street and eight of them are north-bound and 11 south-bound. Two of the south-bound trains run in the morning, five between noon and 2 p. m., and four between 7 p. m. and 8 p. m. Of the north-bound trains, four, starting from Franklin street, run between 5 p. m. and 6 p. m., and make all stops above Seventy-second street; the other four run between 10:43 and 11:19 p. m., and make all stops below Forty-second street. All of the evening trains are called "theatre expresses."

The Southern Pacific has announced at San Francisco that it will undertake to transport fresh fruit to Chicago this year in ventilated cars without ice, and that it will have 500 ventilated cars ready for the service by July 1. The Union Pacific and the Chicago & Northwestern will also furnish 500 cars, and it is promised that the freight will be taken through to Chicago in five days. This announcement, in connection with the recent reduction of rates (\$125 to \$90 a car) by the Armour Refrigerator Line, would seem to indicate that the railroads and the

refrigerator companies are not friendly, in fact that they are in for a contest. The California fruit growers are jubilant over the prospect of saving \$125 a car on their shipments.

Several hundred coal miners in the Pocahontas (Va.) fields struck on May 1, and it was subsequently reported that 15,000 men had gone out. At Charleston, W. Va., on the 3d, the Norfolk & Western Railroad secured an injunction from the United States Court restraining the strikers from interfering with mails or interstate traffic on that road, there having been violence at several places. In some places the rioters burned empty coal cars. On the same days the governors of Virginia and West Virginia ordered large bodies of militia to be in readiness but at last accounts it had not been deemed necessary to send them to the coal regions.

TECHNICAL.

Manufacturing and Business.

The Illinois Steel Co. is to take up the manufacture of railroad spikes at its plant at Joliet, Ill. This is a new and important departure for this company. It has purchased a considerable amount of machinery to manufacture the spikes, and will soon be prepared to turn them out in large quantities. An officer of the company in explaining the reasons for entering upon this line of manufacture, states that the company's orders for rails frequently include angle bars and spikes, and that the company has been obliged to go to outside firms to secure the spikes to fill these orders. It has for some time manufactured angle splice bars, and with the establishment of its new spike manufacturing plant it will be enabled to supply the track fastenings as well as the rails.

Iron and Steel.

Improvements are being made in the Homestead mills of the Carnegie Steel Co. Electric traveling cranes will replace hydraulic ones throughout the works. New heating furnaces are being erected in the 33-in. mill, and the new machine shop is under cover.

The blooming mill machinery of the Johnson Co.'s new plant at Lorain, O., was tested on April 26, and six ingots were rolled for this purpose. The machinery moved smoothly. One ingot was rolled into an 8-in. bloom in 2 minutes 35 seconds.

The North Branch Steel Co., whose works are at Danville, Montour County, Pa., will soon start up its Bessemer steel plant, which has been idle since its construction in 1883. The officers state that owing to the better prices now asked by bloom and billet manufacturers for their product it has been deemed possible to start up the Bessemer plant, which, it is hoped, will be in operation in two months. The rail mill now in operation in Danville gives employment to about 250 men, and the starting of the Bessemer plant will require 500 additional hands. The Bessemer plant is equipped with improved machinery including 24 gross ton converters, a 32-in. reversing blooming train, with an annual capacity of 120,000 gross tons of ingots. The output of the works will be slabs, billets, plates, T-girders, rails, etc. The officers of the company in Philadelphia are: President, Edward Samuel; Vice-President and General Manager, Frank P. Howe; Treasurer, William Selfridge; Secretary, Charles M. Griffiths, and the Resident Manager at Danville is R. K. Polk.

The properties of the Maryland and Pennsylvania Steel Companies at Sparrow's Point, Md., and Steelton, Pa., are to be sold on May 15 to carry out the terms of the reorganization plan. This sale will be in accordance with the plan of the Reorganization Committee, and the properties will be bid in by that committee. The reorganization plan has been assented to by all the interests involved, and the Reorganization Committee will soon transfer the property to the reorganized company. The plant at Steelton has been very busy for some time past, many of the departments experiencing the most prosperous times in their history. The prospects for starting up the plant at Sparrow's Point, Md., are also very good.

The Delaware Iron Co., formerly operated as the Morris Tasker Iron Co., of Philadelphia, has a bill before the Delaware Legislature authorizing an increase in its capital from \$900,000 to \$1,500,000. The iron plant of the company is located at New Castle, Del., the first removal from Philadelphia being made in 1866. The New Castle plant gives employment to 1,000 men when running to full capacity. It is asserted that the new company proposes to locate its entire plant at New Castle, and will soon begin the removal of such departments as still remain at Philadelphia to New Castle.

The Carnegie Steel Works, of Braddock, has an order for 3,500 tons of rails to be used on the New York, Lake Erie & Western between Salamanca and Elmira, N. Y. The delivery of these rails is to be made during the present month.

New Stations and Shops.

The new machine shop for the Goulds Manufacturing Co., at Seneca Falls, N. Y., will be designed and built by the Berlin Iron Bridge Co. The building, as designed, will be constructed with a steel frame and a 15-ton traveling crane.

New Dock for Steel Barge Construction.

The Schultz Bridge Co., at their works at McKees Rocks, a suburb of Pittsburgh, Pa., are building a dock and launching skids for the construction of steel barges. The sections for a steel barge for the Mississippi & Bonne

Terre Transportation Co., of St. Louis, are about finished, and will be assembled as soon as the dock is ready. It is expected to tow the barge to St. Louis on the June rise, where it will be used to transfer freight cars across the river. It has a capacity of 16 cars or about 700 tons, and will cost \$15,000.

Efficiency of the Heine Boiler.

We note with interest the result of the installation of 12 Heine water-tube boilers, aggregating 4,500 H. P., at the works of the Edison Illuminating Co., St. Louis. It was claimed that with much less heating surface the Heine boilers would give better results than the Edison company had obtained with their old type of vertical water-tube boilers. The contract was made with a guarantee to evaporate 8 lbs. of water from and at 212 deg. F. per pound of Illinois coal, of 11,500 heat units. It was further guaranteed that an evaporation would be maintained of 7 lbs. of water per hour, per square foot of heating surface, with less than 1 per cent. entrainment. This is equivalent to 64 per cent. above rating. Tests of the boilers, made by Wm. H. Bryan, M. E., acting with the Edison Co.'s engineers, showed that these guarantees were exceeded. The economy test, running at 36 per cent. above rating, showed an evaporation of 8.335 lbs. of water per lb. of Illinois coal, and the capacity test gave 7.258 lbs. of water per square foot of heating surface, equal to 70.3 per cent. above rating, with .84 of 1 per cent. entrainment. As a result of these tests, the Edison Illuminating Co. paid the Heine Co. \$1,500 bonus.

Compounds for the Pennsylvania.

Drawings for a compound freight locomotive are being prepared at Altoona, and the shop work is going on in the construction of this engine as fast as the detail drawings are ready. This will be a 2-cylinder compound with three pairs of drivers, designed for freight service only, and it is estimated that the power obtained will be somewhat greater than with the standard class "R." The class "R," it will be remembered, is the Pennsylvania consolidation which has often been described in print.

The Melan Construction.

Mr. Fr. von Emperger has recently erected at Stockbridge, Mass., a 100 ft.-span Melan arch. This has been seen during construction by a good many engineers who have been interested in seeing the actual work. It is now completed.

An Order for Rails.

The Pennsylvania Railroad Co. has ordered 20,000 tons of rails at a price of \$22 a ton. The contract was divided between the Carnegie, Cambria and Pennsylvania steel companies. So far this year the Pennsylvania has ordered 47,000 tons of rails.

75 Cars Air-Braked.

A freight train of 75 cars, on which the air-brakes were in operation on every car, was successfully run from Sunbury, Pa., to Rockville, over the Northern Central, 48 miles, on April 29. The cars were loaded with wheat for Baltimore. The grades of this division are very light.

Compounds on the Mexican Central.

The double ended compounds used on the Mexican Central, which were illustrated in the *Railroad Gazette* March 25, 1892, have given very satisfactory results. The performance of these locomotives has been better than the 20 x 24 in. simple engines, which are operated on the same division and do the same work. The average number of miles run by each of these engines per month exceeded that made by the simple engine by 17.9 per cent. and the saving in fuel consumption per engine mile was 19.3 per cent. The average train weight hauled by the compounds was almost 2 per cent. greater than that by the simple engines, thus showing a saving in fuel of 21.3 per cent. per ton mile. Less oil per mile was used by the compounds, and in doing 21 per cent. more work, the cost for repairs was 11 per cent. less than that for the simple engines. A saving in stores of 30 per cent. was also shown and 24.6 per cent. more work per dollar of expense was done.

According to these results it is evident that the compounds are more economical for the work than the simple engines and a new compound has been recently built for this road by the Rhode Island Locomotive Works. Quite a number of improvements were made in this engine over the ones first built, and still better results are expected from it.

Recent Armor Tests.

The long continued battle for supremacy between the armor piercing projectile and the armor plate, which has lately been rather in favor of the projectile, is now, as a result of a number of recent armor plate tests, about a tie. A test of an 18-in. plate made on May 1 at the Indian Head proving grounds resulted in a victory for the armor plate. The plate tested was one of a lot of 10 similar plates for the side armor of the battleship *Oregon*. It was attached to a 36-in. solid oak backing by 26 3-in. bolts, the entire structure being anchored in a hillside about 100 yds. from the guns. The first two shots fired were from a 12-in. rifle. The first was an 850-lb., 12-in. Holtzer shell driven by 249.8 lbs. of brown hexagonal powder. The velocity of the projectile was 1,465 ft. per second and its striking energy was 12,662 foot tons. This shell struck the plate about 78 in. from its left edge and 38 in. from the top. Its velocity was so calculated as to crack the plate if possible, this being the cracking test. The projectile penetrated about 6 in., bulging the surface of the plate for 3 in. about

its point of entrance. Of the shell which weighed 850 lbs., no fragments were found weighing more than a few pounds. For the second shot a similar projectile was used, the powder charge being increased to 443.4 lbs. This gave a muzzle velocity of 1,926 ft. and a striking energy of 21,885 foot tons. The shot struck the plate at a point 42 in. to the right of the first shot. It was the penetration test, and as nearly as could be estimated the projectile entered about 10 in. The high temperature caused by the sudden transformation of the striking energy into heat fused and welded together the point of the shell and the plate. The metal of the plate was fused for 6 in. around the point where the projectile struck. This shot developed a $\frac{1}{4}$ in. surface crack in the plate, extending from the top to the bottom. The plate was then accepted.

To determine what would be the result of a 13-in. projectile, which is about the heaviest now used in naval warfare, a 13-in. Carpenter shell weighing 1,100 lbs. and driven by 489 lbs. of powder was discharged with a velocity of 1,810 ft. The striking energy was 25,000 foot tons. The projectile was destroyed; and while a 3-in. crack was made near the top of the plate the point of the projectile penetrated only 10 ins., and only one of the 26 fastening bolts was damaged. The backing, however, was completely destroyed. These results indicate an efficiency in armor plate not hitherto attained in any tests, so far as we know.

The Traveling Engineers' Association Circular.

The Traveling Engineers' Association has issued two circulars for the purpose of collecting information for the C. committee which reports at the next annual meeting. The circular about fuel and water supplies for railroads inquires about how these supplies are controlled, whether by the operating or mechanical department, and about the methods followed to determine the ingredients of the feed water, the life of flues and the methods followed in attempting to purify the water and to prevent scale.

The circular about air-brake instructors inquires into the plan followed for instructing trainmen and others and about re-examinations from time to time. These circulars are well arranged and the questions are careful ones and go right to the bottom of things.

THE SCRAP HEAP.

Notes.

Forest fires did great damage in Elk County, Pa., on May 5. At Glen Hazel a large amount of lumber was burned up, together with 16 cars and other property of the Erie Railway.

At Portland, Or., on April 29, Judge Gilbert, in the United States Circuit Court, directed the Receivers of the Northern Pacific not to obey orders of other courts garnishing the wages of employees.

A tornado, killing many persons, swept over Sioux County, Ia., on May 3. The track of the Sioux City & Northern Railroad was badly washed between Perkins and Doon. A bridge over the Sioux River near Sioux Falls, S. D., was blown down.

The law confirming certain acts of the Buffalo grade crossing commissioners, and another strengthening the powers of that body, have passed the New York Legislature after a prolonged contest. According to the Buffalo newspapers, the New York, Lake Erie & Western Railroad has been the principal objector to the passage of these bills.

The through day passenger trains of the Wabash lines east of the Mississippi are to enter St. Louis over the Merchants' Bridge instead of the old bridge. It would seem from the announcement that the change is made chiefly to avoid the tunnel, for the comfort of the passengers. Local passenger trains will continue to run over the old bridge.

The North Carolina Railroad Commission has served notice on the Western Union Telegraph Company to show cause why it should not be fined for contempt for disobeying a recent order of the Commission in fixing 25 cents as the rate from Raleigh to Elizabeth City, N. C., a decision which the Supreme Court of that state had ruled upon and approved.

R. P. I. Entrance Examinations.

Entrance examinations for the Rensselaer Polytechnic Institute will be held in Troy on May 29, and on Sept. 11 and 12. To provide for those desiring to be examined outside the city, special examinations will be held at numerous preparatory schools throughout the country. A list of these schools, as well as much other information concerning the Institute, will be found in the *Register* for 1895, which can be had upon application to the Director, P. C. Ricketts, Troy, N. Y.

Railroad Disaster in Mexico.

Press dispatches of April 30 report a derailment on the 29th at Tememata, Mexico, on the Inter-oceanic Railroad at the same place where 65 passengers were killed on Feb. 28. It is said that the last disaster was to a freight train, and that 14 persons were killed.

Fast Runs.

A special passenger train of three cars was run over the Balt more & Ohio from Philadelphia to Washington a few days ago in 2 hours, 22 minutes. This is said to be the fastest time ever made between the two cities. The distance is 135 miles, which makes the average speed 57 miles an hour. The train was drawn by engine No. 849.

On April 25 a special train of an engine and one car was run from Denver, Col., to Ogden, Utah, over the Union Pacific, 623 miles, in 14 $\frac{1}{2}$ hours, equal to 42.96 miles an hour. The train was delayed about an hour by hot boxes, and it is said that the actual running time from Cheyenne, 516 miles, was 47 miles an hour. The

Sixth Division, 137 miles long, which has many steep grades and sharp curves, was traversed at the rate of 48 $\frac{1}{2}$ miles an hour.

Robbers.

On the night of May 1 the engineman of a passenger train on the Chicago & Alton was shot and killed near Carlinville, Ill., by a man who crawled over the tender from the baggage car. There were inoffensive traps on the train at the same time and the accounts are not clear as to the purpose of the robbers. Three men were arrested and put in jail. This tragedy has led to increased activity on the part of the promoters of the bill now before the Illinois Legislature, similar to that recently passed in Missouri, allowing train robbery to be punished by death.

Morgan, one of the men who robbed an express car at Acquia Creek, Va., has been sentenced to 18 years' imprisonment.

Transportation Club.

This is the name of a club, for social purposes, recently incorporated in New York City by prominent officers of the New York Central & Hudson River Railroad and their friends. It is proposed to have a suite of rooms in the twelfth story of a new hotel that is now being built at the corner of Madison Avenue and Forty-second street by the proprietors of the Windsor Hotel. It is intended to maintain a dining room, library and reading room. Among the incorporators are Cornelius Vanderbilt, Chauncey M. Depew, Edward V. W. Rossiter, Charles F. Cox, George H. Daniels, Nathan Guilford, Ira A. Place, H. Walter Webb, Edgar Van Etten, Thomas L. James, Ashbel Green, Frank Loomis, George B. and Frederick W. Schoonmaker, John B. Dutcher, Percy R. Todd and Samuel Barton.

The Baltimore Belt Line Tunnel.

All trains to and from New York on the Baltimore & Ohio Railroad passed over the Belt Line on May 1. Up to 1 o'clock on May 2, 26 trains had passed through the tunnel. When the trains for New York arrived at Camden Station they were run up to the platform, and when the Baltimore passengers were aboard the trains were backed out of the station to Hamburg street crossing, where they were switched to the tunnel tracks. Trains arriving from New York were backed into the station. This arrangement will continue until the new station is built at Lombard and Howard streets. The road officials say there is practically no time lost in backing in and out of Camden Station as compared with the time occupied in crossing the ferry. A block system has been adopted in the tunnel.

Opening of the Seventh Avenue Bridge.

The Seventh avenue swing bridge over the Harlem River at New York was opened to traffic on May 1. Certain legal troubles regarding land grants had delayed the opening of the bridge, although it had been completed for some time. The steel swing span is 408 ft. 6 in. long and weighs 3,328,000 lbs. There are four approaches, two at each end. It is one of the finest steel swing spans in the country.

New Lake Steamer Ordered.

The Detroit Dry Dock Co. has secured the contract to build a new steamer for the Cleveland & Buffalo Transit Co., for the Cleveland-Buffalo route. She will be the largest side-wheeler on the Great Lakes. The cost will be about \$375,000 and the boat will be ready for business on April 1 next. The new steamer will be 308 ft. long over all, 40 ft. 6 in. molded beam, and 17 ft. deep. Her hull will be built of open-hearth steel. Her engines will be of the compound, walking-beam type with a low-pressure cylinder, 80 in. in diameter, and a stroke of 12 ft. She will have sleeping accommodations for 600 people.

Some Recent Ships Launched on the Lakes.

Among the late additions to the lake fleet are the great steel ship *J. J. McWilliams*, which has just been launched at Bay City. The vessel is 370 ft. over all and will carry 4,000 tons with 16-ft. draft. The *Chili* was launched the same day at Cleveland. She is 342 ft. over all, of steel, and will carry 3,400 tons on 16 ft. of water. A wooden schooner was later put afloat at the Bay City yard of James Davidson. She will carry 3,300 tons on 16 ft. draft. The *McWilliams* is owned by Mitchell & Co., the *Chili* by a syndicate of Cleveland, Buffalo and Duluth parties, and the schooner by the builder. The wood ship *Argo*, 203 ft. over all, was also launched at Detroit for C. R. Jones & Co. for the lumber trade. Several more large vessels are soon to be launched.

The largest ship on the lakes will be the *Zenith City*, named for and owned in Duluth, and being built at the yard of the Chicago Shipbuilding Co., of which Mr. W. L. Babcock is manager. The *Zenith City* is 402 ft. over all, 380 ft. keel, her beam the extreme of 48 ft., and her depth 28 ft. This carrier is expected to float 6,000 tons on a draft of 18 ft. It is likely that she will carry considerably more than this. The ship is built of mild steel throughout, with all floors, frames, deck beams, belts, stringers and ties of steel channels. She has only one deck-house, and that is of steel. The ship is fitted for bulk freight only, and has no deck on main deck beams, except forward and aft. There is a water bottom 5 ft. deep, from collision to engine bulkhead, which will carry 1,900 tons of water ballast. The ship's engines are built by the Cleveland Shipbuilding Co., and are triple expansion, inverted direct-acting, jet-condensing, with connected air pump. They are 22-in., 37-in. and 63-in. cylinders and 40-in. stroke. There are two boilers of the Babcock & Wilcox tubular type, something new on shipboard, having about 6,000 sq. ft. of heating surface and carrying 200 lbs. of steam. The ship has a Providence steam windlass and capstan forward and steam capstan aft. There is a steam deck hoister, Williamson steam steerer, two large ballast pumps, two direct connected Fisher dynamos, which furnish current for a full outfit of arc and incandescent lights. The vessel will make 12 miles an hour loaded without crowding, and is owned by the Zenith Transportation Co., of Duluth, at which A. B. Wolvin is President and F. E. Searle is Treasurer. She is noteworthy as the most advanced type of freight vessel ever planned and built on the lakes.

A Railroad Up the Nile.

A contract has been made with a German company to build a railroad from the present terminus of the Upper Egypt Railroad to Assouan, a distance of 174 miles. This will give rail communication from the Mediterranean right up the Nile to the first cataract. Unfortunately, it has been decided to make this new line 3 ft. 6 in. gage, the Egyptian railroads, of which it is a continuation, being 4 ft. 8 $\frac{1}{2}$ in. We suppose that the reason for this must be that this new line is looked upon as the beginning of a Sudan system, to be carried ultimately a great many miles further, to Khartoum, and that it is thought best to make this system narrow gage for the sake of economy. As the traffic will in any event be very light the tax due to the transshipment of freight will not be a serious matter.

CAR BUILDING.

The Cleveland, Cincinnati, Chicago & St. Louis has placed an order for 300 stock cars with the Indiana Car & Foundry Co.

The Louisville & Nashville has just given out an order for 950 freight cars divided between the Mt. Vernon Car Co., of Mt. Vernon, Ill., and the Elliott Car Co., of Gadsden, Ala. The Mt. Vernon order includes 250 box and 400 gondola cars, and that of the Elliott Co., 250 box and 50 ore cars.

The Pullman Car Co. has secured the Columbus, Hocking Valley & Toledo order. This was for 900 gondola cars and was given out last week. The Pullman Co. also has an order for four passenger cars for the Cleveland, Cincinnati, Chicago & St. Louis, both of these contracts refer to orders mentioned in this column some weeks ago.

The Toledo, Ann Arbor & North Michigan order, which is to be for 500 box cars, is still being delayed by the failure of the receivers to secure the necessary authority from the court. The failure of the court so far to confirm the recent foreclosure sale of the railroad will probably prevent the receivers from taking any action toward putting the cars under contract for quite a long time.

BRIDGE BUILDING.

Baltimore, Md.—The controversy between the Baltimore & Ohio Railroad and the city of Baltimore as to the sum which should be assessed on the Baltimore & Ohio Railroad as its portion of the cost of changing the level of the western approach of the North avenue bridge in Baltimore is apparently still far from a settlement. The city authorities claim that the railroad company should pay the total cost of this western approach which is estimated at over \$125,000. In the city ordinance authorizing the erection of the bridge it was provided that the Baltimore & Ohio should be assessed a certain amount; \$92,000 for the western approach, \$9,000 for increasing the height of the bridge to cross the railroad tracks, in all aggregating \$104,000. This amount, President Mayer states, the railroad company is willing to pay as the total amount to be assessed against the railroad company. This proposition the city authorities have so far declined to accept, but it is admitted to be doubtful by the legal department of the city if more than that sum can be claimed of the railroad.

Cincinnati, O.—The Board of Public Works has awarded a contract to the Pennsylvania Steel Co., at \$37,988 for the erection of the West Eighth street viaduct over the Bold Face Creek. The Pennsylvania Co. was the lowest bidder for the work. The next highest bidder, the Cincinnati Architectural Iron Works, protested against the award being made as it was, on the ground of some informality in the bid of the Pennsylvania Steel Co., a failure to make the usual affidavits. The Corporation Council deciding that the protest was well taken and the Board of Public Works rescinded the contract. It has not yet been decided whether new bids will be called for or the contract will be given the next highest bidder, the Cincinnati concern, at \$39,798.

Cleveland, Lorain & Wheeling.—The Cleveland Lorain & Wheeling has been receiving bids for 20 steel bridges, to be constructed on the main line of the road south of Urichsville, taking the place of lighter structures along the line.

Halifax, N. S.—The Government of Nova Scotia invites tenders for the iron work and erection of the Kennetcook Bridge, in the County of Hants, to consist of three spans of 150 ft. each, center to center of end piers. The Kennetcook River is subject to heavy ice floats that run with the Bay of Fundy tide. The roadway is to be 16 ft. wide in the clear. A substantial lattice railing is to be erected continuously on both sides of the bridge for its whole length. The contract is to embrace all iron work in the superstructure, and the erection shall also include the timber work of floors. The work shall be performed to conform in every respect to general specification and conditions of contract, a copy of which will be sent on application. Parties tendering for the bridge are requested to furnish a side and end elevation of one span, as well as a strain sheet, as the form and method of construction will be considered, as well as the price named in tenders, in awarding the contract. The whole iron work and floors of bridge to be completed, ready for traffic, by October. Plans, specifications and form of tenders and all information can be obtained from Dr. Murphy, Provincial Engineer, Halifax, N. S. Tenders to be endorsed "Tender for the Kennetcook Bridge," and addressed to Mr. Charles E. Church, Commissioner of Public Works and Mines, Halifax, N. S., will be received up to May 18. Parties may tender upon their own plans, but they will be subject to the approval of the Provincial Engineer.

Hamilton, Ont.—Messrs. Carpenter & Henderson had an interview with the Minister of Public Works at Ottawa last week, urging the construction at once of the proposed bridge over the canal at Burlington. The original estimate for the work was \$22,000, but owing to difficulties in construction the cost will likely exceed this amount by \$6,000 or \$8,000.

Hawkebury, Que.—Engineers of the Great Northern Railway are taking surveys for the proposed bridge over the Ottawa River, at this place, to connect the Great Northern with the Canada Atlantic Railway.

Kansas City, Mo.—J. A. L. Waddell, Consulting Engineer, Kansas City, Pittsburgh & Gulf Railway, has awarded the contract to the Pittsburgh Bridge Co., of six spans, 50 ft. deck girders, and three spans of 100 ft. through trusses, medium steel, reamed.

Montreal, Que.—At a meeting of the delegates from Back River and adjoining municipalities, held last week, it was decided to erect a new bridge, to cost \$5,000, the cost to be borne by the municipality of Back River.

New York City.—The work of building the Blackwell's Island bridge across the East River between New York and Long Island City was got under way last week by the laying of the foundation for the pier on the east side of Blackwell's Island. The cofferdam on the east side of the Island has been building for some time, and the excavation is now ready for the foundation. The crib work on the Long Island City shore is about 200 ft. long. It is expected that the span connecting Long Island City and Blackwell's Island will be the first constructed.

Portland, Me.—The Portland & Rumford Falls Railroad is to build three iron bridges this season, at a cost of \$12,000, one at the Allen bridge, 40 ft. span, Buckfield; two spans, 60 ft. each, and Sumner, 80 ft. span.

St. John, N. B.—Tenders are asked by the Provincial Government for the rebuilding of the bridge over the Goldsmith stream in the parish of Ste. Croix.

Ste. Anne de la Perade, Que.—Mr. J. A. Baribeau, Secretary-Treasurer of the Municipal Council, will receive tenders endorsed "Tender for the Ste. Anne de la Perade Bridge" up to May 15 next, for the construction of the iron bridge with stone piers over the river Ste. Anne, referred to in this column on April 5.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago & Alton, quarterly, 2 per cent. on the preferred and common stock, both payable June 1 to stock and record May 10.

Chicago Junction Railway & Union Stock Yards Co., quarterly, 1½ per cent. upon the preferred stock, payable April 30.

Cleveland & Pittsburgh, quarterly, 1¼ per cent. upon the guaranteed stock, payable June 1.

Lake Erie & Western, quarterly, 1¼ per cent. on its preferred stock, payable May 15.

Pennsylvania, semi-annual, 2½ per cent., payable May 31.

Rome, Watertown & Ogdensburg, 1¼ per cent., payables May 15.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Burlington, Cedar Rapids & Northern, annual, Cedar Rapids, Ia., May 28.

Chicago & Northwestern, annual, Chicago, June 6.

Chicago, St. Paul, Minneapolis & Omaha, annual, company's office in Hudson, Wis., June 8.

Delaware & Hudson Canal, annual, 21 Cortlandt street, New York city, May 14.

Manchester & Lawrence, annual, Manchester, N. H., May 31.

Missouri, Kansas & Texas, annual, Parsons, Kan., May 15.

New York & Harlem, 65th annual, Grand Central Station, New York, May 21.

Omaha & St. Louis, annual, Stanberry, Mo., May 21.

Pittsburgh, Ft. Wayne & Chicago, annual, Pittsburgh, May 15.

Pittsburgh, Youngstown & Ashtabula, annual, Youngstown, O., May 16.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The **American Railway Accounting Officers** will hold its seventh annual meeting at Detroit, Mich., commencing Monday, May 29, at 10 o'clock a. m.

The **National Association of Local Freight Agents** will meet in New York City at the Broadway Central Hotel on June 11.

The **State Railroad Commissioners** will hold their seventh annual convention at the rooms of the Interstate Commerce Commission, Washington, D. C., beginning May 14.

The **Master Car Builders' Association** will hold its annual convention at Thousand Islands, Alexandria Bay, N. Y., commencing June 11.

The **Master Mechanics' Association** will hold its convention at the same place, commencing June 17. Applications for rooms for both conventions should be made to J. B. Wistar and Charles W. Crossman, both at Thousand Islands, Alexandria Bay, N. Y.

The **International Railway Congress** will meet at the Imperial Institute, London, England, beginning June 26.

The **American Society of Civil Engineers** will hold its annual convention at Nantasket Beach, commencing June 18.

The **Western Railway Club** meets in Chicago on the third Tuesday of each month, at 2 p. m.

The **New York Railroad Club** meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The **New England Railroad Club** meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The **Central Railway Club** meets at the Hotel Iroquois, Buffalo, N. Y., on the fourth Wednesday of January, March, April, September and October, at 10 a. m.

The **Southern and Southwestern Railway Club** meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The **Northwestern Railroad Club** meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The **Northwestern Track and Bridge Association** meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m.

The **American Society of Civil Engineers** meets at the House of the Society, 127 East Twenty-third street New York, on the first and third Wednesdays in each month, at 8 p. m.

The **Western Society of Engineers** meets on the first Wednesday in each month, at 8 p. m. The headquarters of the society are at 1736-1739 Monmouth Block, Chicago. The business meetings are held on the first Wednesday at its rooms. The meetings for the reading and discussion of papers are held on the third Wednesday at the Armour Institute, Thirty-third street and Armour avenue.

Society of Naval Architects and Marine Engineers.

The next general meeting of the society will take place in New York City on Nov. 7 and 8, 1895. A list of papers to be read and other particulars will be sent to members as soon as all arrangements have been made.

The Western Society of Engineers.

On Saturday, April 27, the first excursion arranged by the Committee on Excursions and Entertainments took place. The power house of the Chicago Electric Transit Company was visited by about 40 of the members and guests, who had the opportunity of seeing one of the best equipped power plants in the city.

Buffalo Air Brakeman's Club.

A meeting of this club, which is composed of persons interested in air-brakes and who are connected with railroad lines centering in Buffalo, was held at the Tiff House, Buffalo, April 25. President J. W. Shannon, of Buffalo, presided. Subjects relating to the care of the air pump, care and abuse of the engineer's valve, of brake cylinders, and of triple valves were discussed. The club will meet next upon the fourth Thursday in October.

International Association of Ticket Agents.

The next annual convention of the International Association of Ticket Agents will be held at Boston and is to begin on Sept. 11. The official headquarters of the Association during the meeting will be at the United States Hotel. The special cars from Chicago, Cincinnati, St. Louis and other Western cities will be made up

into a train at Niagara Falls and then go East over the New York Central and Boston & Albany road. After the convention the delegates will make a tour of the White Mountain resorts and Bar Harbor.

Engineers Society of Western Pennsylvania.

At the last regular monthly meeting of the club in the Carnegie Library Building in Allegheny, Mr. E. D. Estrada read a paper on the "Expansion of Cast Iron at the Moment of Solidification," referring particularly to the paper read by Robert Hallott before the Royal Society of England in 1874, who argued that contraction and not expansion occurs at solidification. The president appointed a committee to report at the next meeting on the advisability of the club joining the Association of Engineering Societies.

Road and Track Supply Association.

The next meeting of the Road and Track Supply Association will be held at St. Louis, commencing on Tuesday, Oct. 15, the headquarters being at the Southern Hotel. The Roadmasters' Association meets in the same city at that time. This association was organized during a recent convention of the Roadmasters' Association, to provide proper displays of track tools and devices at the Roadmasters' conventions. The membership of the association is made up of manufacturers of railroad appliances and their representatives, and at present about 50 such firms have become members. The officers elected last September are W. W. Salmon, President; F. A. Johann, Vice-President, and W. H. Stearns, of Chicago, Secretary and Treasurer.

Engineering Association of the South.

At the monthly meeting of the Association at the headquarters at Nashville, on April 11, arrangements were made for the semi-annual meeting on May 9. A trip will be made to the government locks on the Cumberland River, the members leaving Nashville early in the morning by train to Edgefield Junction, where they will take a boat for the Government Locks, and one of the engineers on the work will describe the improvements. At the meeting on April 11 the committee which had been appointed to recommend various changes in the state roadway laws made a report and a general discussion followed. At the meeting held on April 25 "City Street Paving" was the subject of discussion, introduced by Mr. W. M. Leftwich, Jr.

Engineering Association of the South.

The regular informal meeting for this month was held at Nashville on April 25. Mr. Leftwich spoke on city street paving, confining himself mostly to brick and granite paving in Nashville. A general discussion followed, the main features of which were the condemnation of macadam for city paving, and the recommendation of standard specifications for use over the entire country.

The annual trip of the association will be made to the government improvements on Cumberland River, as already announced. The association will go on Saturday, May 11, 1895, by the L. & N. 7 a. m. train to Edgefield Junction, where they will be met by boat and go to Locks Nos. 3 and 4, returning by boat to Lock No. 2, and reaching Nashville the same evening.

Western Railway Club.

At the April meeting of the Western Railway Club the first business was the consideration of the matter of the new constitution and by-laws. The proposed constitution was read and laid over for action at the next meeting.

A discussion of Mr. Goodnow's paper on the train staff was taken up, and extracts from the discussion appear elsewhere in this issue.

A long discussion was held on strength of car axles, a considerable abstract of which will be given in the *Railroad Gazette*.

The meeting closed with a discussion of the report of the committee on the revision of the rules of interchange as presented at the February meeting. This was very long. A summary will be given in the *Railroad Gazette*.

The Western Foundrymen's Association.

The regular monthly meeting of the Western Foundrymen's Association was held April 17 in Chicago. About thirty members were present, with President Geo. M. Sargent in the chair.

A committee to nominate officers was appointed, and while they were in session topical discussion was had on the question of "What Causes Chilling in Iron Castings." Mr. F. W. Sargent, Mr. A. Sarge, Jr., and Mr. John M. Sweeney speaking on the subject.

The Secretary read the paper of the evening on "Future Improvements in Foundry Work," by Mr. Herbert M. Ramp.

One of the principal points brought out by Mr. Ramp was the necessity of foundries confining themselves to one class of work in order to cheapen the cost of production and turn out a better class of work. Improvements in the equipments of foundries would save time and add to the production. Among the improvements suggested were the use of molding machines, compressed-air hoists and the overhead trolley system for handling work, mechanical mixers for core sand, overhead conveyors for molders' sand, etc.

He spoke also of the necessity of keeping records in order that a man may be able in the future to obtain a fair knowledge of the art without having to learn it by hard experience. In this respect he said that foundry work was behind most of the other mechanical arts.

Engineers' Club of St. Louis.

The club was called to order at 8:15 p. m., April 17, 1895, by President Russell. Eighteen members and six visitors present.

The Executive Committee reported the doings of its 187th meeting, approving the application for membership of Mr. Thos. Ashburner. He was balloted for and elected. An application for membership was announced from Mr. H. A. Wagner, General Superintendent of the Missouri Electric Light and Power Company, and Edison Illuminating Company.

Prof. Johnson then introduced Prof. Leonard S. Smith, of the University of Wisconsin, Madison, Wis., who read a paper on "An Experimental Study of Field Methods which will Insure Greatly Increased Accuracy to Stadia Measurements." The professor had had occasion to make an exhaustive study of stadia methods and the effect of work done at various hours of the day, and under varying conditions of the atmosphere. Two points were covered: First, a study of what is known as boiling or unsteadiness of the air, the effect of which he termed differential refraction. Second, the effect of this refraction upon the accuracy of stadia measurements. The Professor had spent considerable time on this work in connection with the international boundary survey between this country and Mexico, and his experiments were continued last summer at Madison, Wis. His researches, which were very exhaustive and made with the greatest care, enabled him to formulate some general suggestions regarding stadia work, which, if followed, would enable that system to be employed satisfactorily

on work requiring a greater degree of accuracy than has heretofore been deemed possible.

In the discussion which followed, participated in by Messrs. Holman, Kinealy, Johnson, Ockerson, Colby and Van Ornum, the universal opinion was that Professor Smith's work was of great value to the profession, as it marked a decided advancement in our knowledge of stadia work.

Engineers' Club of Philadelphia.

At the meeting of the club on April 6, Mr. E. H. Newell, Chief of the Hydrographic Division of the United States Geological Survey, read a paper which he had prepared for the club on Methods and Results of Measurements of Stream Discharges, made by the United States Geological Survey. He first dwelt upon the necessity of a comprehensive knowledge of the water supply of the country, both for the development of water powers and agriculture by irrigation, and of proper systems of municipal and domestic supply. He referred incidentally to the great problem of the public lands, and by maps and diagrams showed the enormous extent of these, and the dependence of their value upon irrigation. The public lands of the United States now open for settlement, mainly under the homestead act, comprise nearly one-third of the whole area of the country, exclusive of Alaska. By far the greater portion of these may be considered as grazing lands, only a small part, say ten per cent., being absolutely of desert character. The soil, in general, is extremely fertile, and with water produces abundant crops. These public lands, although known as arid, contain within their borders, mountain ranges from which issue rushing torrents, and many streams of considerable magnitude. Wherever these streams can be diverted and brought to the land, prosperous homes can be built, and a dense population supported.

Not only is agriculture possible in many parts of the arid west, but the streams, though small compared with those of the east, have rapid fall in their course from the high summits, and though of limited volume, possess capabilities of high power without detracting from the ultimate use of the water upon the lands. This power, when utilized and transmitted renders possible many kinds of industries. The mineral wealth of this part of the continent is well known. The subject was discussed by John E. Codman, John Birkinbine, Rudolph Hering, J. C. Trautwine, Jr., and A. Falkenau.

The Iron and Steel Institute (British).

The 1895 annual meeting of the Institute is held this week, Thursday and Friday, in London. At the first day's meeting the Bessemer gold medal for 1895 was presented to Henry M. Howe, Esq., in acknowledgment of his great services to the literature of steel making. The President elect, David Dale, Esq., delivered his inaugural address, and in the evening the annual dinner was held. At the Friday's meeting the following papers were to have been read and discussed:

On Metal Mixers as used at the Works of the North-eastern Steel Company, Limited. By Arthur Cooper, member of Council.

On the Hardening of Steel. By H. M. Howe, Bessemer Gold-Medallist.

On Tests of Cast Iron. By W. J. Keep.

On the Manufacture of Steel Projectiles in Russia. By Sergius Kern, Metallurgist to the Russian Admiralty.

On the Iron Ore Mines of Elba. By Herbert Scott.

On the Effect of Arsenic upon Steel. By J. E. Stead.

Association of Engineers of Virginia.

The March meeting of the association was held on March the 28th, being postponed from March 20th. The meeting was called to order by the President, Mr. J. C. Rawn.

A communication from the Engineers' Club of St. Louis was read asking that this association use its influence in bringing into general use the "Decimal Gage" for wire and sheet metal that is to be proposed by the American Society of Mechanical Engineers and the American Railway Master Mechanics Association.

Messrs. G. R. Henderson, C. S. Churchill and R. H. Soule were appointed a committee to report on this matter.

The paper for the evening, "Cement from Furnace Slag," was called and an interesting discussion of the subject was given by Mr. Herman Creuger. The chemical analysis of the various kinds of cement was given and along with it the analysis of the various local furnace slags to show that good cement could be produced at Roanoke at low cost. A plan for a factory for its production, with estimates of cost, etc., were also given. The paper was referred to the Publication Committee.

The April meeting of the association was called to order April 17, with President J. C. Rawn in the chair. Prof. L. S. Randolph, of Blacksburg, Va., read a paper on "Engineering Education," in which he brought out the distinctive features in the methods of teaching in England, in Germany and in America.

Boston Society of Civil Engineers.

A regular meeting of the society was held April 17 at its rooms, 36 Bromfield street, Boston, 65 members and visitors being present.

President Albert F. Noyes, on assuming the chair, thanked the members for the honor conferred upon him in the election to the presidency for the coming year. He promised the society his best efforts to advance its work and solicited the earnest co-operation of each and every member.

The Secretary reported for the Board of Government that it had appointed the following special committees:

On Excursions: H. B. Wood, H. S. French, W. B. Fuller, J. W. Rollins, Jr., and I. N. Hollis.

On the Library: F. L. Locke, S. E. Tinkham, H. D. Woods, F. E. Sherry and W. S. Pope.

On Quarters: Thomas Doane, Desmond Fitzgerald, E. W. Howe, M. M. Tidd and C. F. Allen.

Members of the Board of Managers: S. E. Tinkham, J. R. Freeman, Henry Manley and Fred. Brooks.

The Secretary read a communication from the Board of Direction of the American Society of Civil Engineers, inviting this Society to attend the annual convention to be held at the Hotel Pemberton, beginning June 18, 1895. The invitation was accepted with the thanks of the Society by a unanimous vote. It was further voted that a committee of three to represent the Boston Society of Civil Engineers be appointed by the President to aid the local committee of the American Society of Civil Engineers in its work. Later in the meeting the President named as this committee Messrs. Dexter Brackett, Fred. Brooks and T. Howard Barnes.

A communication was read from the Engineers' Club of St. Louis calling attention to the action of that Club on the question of standard gages for thickness of metals, and requesting this society to concur in the proposed action. It was voted to refer the communication to the Board of Government to be reported upon in connection with the communication on the same subject from the American Society of Mechanical Engineers, now before the Board.

The President announced the deaths of two members of the society, John H. Webster, who died April 2, 1895, and Adelbert L. Sprague, who died April 12, 1895. On motion the President was requested to appoint committees to prepare memoirs, and the following appointments were made: On memoir of Mr. Webster, Messrs. J. A. Tilden and J. R. Freeman; On memoir of Mr. Sprague, Messrs. F. O. Whitney and F. A. Foster.

Mr. Walton I. Aims, C. E., of New York, was then introduced and read a paper entitled "Notes on the Construction of the East River Gas Tunnel." The paper gave a very full history of the work and was illustrated by a large number of lantern views.

At the close of the discussion which followed the reading of the paper, on motion of Mr. Fitzgerald, the thanks of the society were extended to Mr. Aims for his very interesting and valuable paper.

At the meeting of the society to be held on May 15, Mr. J. Parker Snow, Bridge Engineer, B. & M. R. R., will read a paper on "Wooden Bridges." A paper will also be read by Mr. R. S. Hale on "The Analysis of Coal Used Under Different Loads in an Edison Electric Light Station."

PERSONAL.

—Mr. Henry P. Nichols, Agent of the Boston & Albany at Worcester, Mass., has just resigned after 47 years continuous service for the company.

—Mr. M. C. Doyle who has been connected with the Lehigh Valley for a number of years as General Foreman at Manchester and Victor, N. Y., has been promoted to be Roadmaster of the Buffalo Division.

—Mr. R. B. Swope, Superintendent of the Plant system of railroads from Sanford to Port Tampa, has resigned, and A. J. Ford, now Trainmaster of the Punta Gorda branch of the Florida Southern, will succeed him.

—Mr. Harry Delaney, Superintendent of Motive Power on the Louisville, New Albany & Chicago for the past three years, has resigned, and Mr. Henry F. Watkeys, Master Mechanic, it is said, will probably be his successor.

—Mr. F. P. Jefferies, formerly District Passenger Agent at Toledo of the Cincinnati, Hamilton & Dayton, has been appointed Assistant General Freight and Passenger Agent of the Evansville & Terre Haute, at Terre Haute, Ind.

—Mr. A. R. Meyers, Auditor of the Paducah & Alabama, and Tennessee Midland railroads, has resigned his position, to take effect May 15, and Mr. R. G. Browning, the present assistant auditor, will be promoted to the vacancy.

—Mr. R. L. McKellar, General Western Agent of the Memphis & Charleston, with headquarters at St. Louis, has been appointed Assistant General Freight Agent, vice J. S. Davant, resigned to become Commissioner of the Memphis Freight Bureau.

—Major Campbell Wallace, for several years and until recently a Railroad Commissioner in the State of Georgia, died May 3, at his residence in Atlanta. He was nearly 90 years of age, and for many years had been a prominent figure in Georgia politics.

—Mr. John P. Rafferty, Vice President of the New York, Susquehanna & Western Railroad, has resigned that office to which he was elected several years ago. He was formerly the Secretary and Treasurer of the company, and continued to act as Secretary.

—With the reorganization of the Prussian State Railroads, the Ministry of Public Works has an Under Secretary of State, and the appointment of Ministerial Director and Privy Councillor Brefeld to that post, the second position in the greatest of railroad administrations is announced.

—Mr. F. L. Tompkins, Superintendent of the Chicago, Peoria & St. Louis Railroad, has just been elected General Superintendent of that line in charge of the operation of the railroad, succeeding Mr. James E. Palmer. Mr. Horace S. Rearden, who has been Master of Transportation on the Chicago, Peoria & St. Louis, has been appointed Superintendent of that line.

—Mr. James McNaught, who has been General Counsel of the Northern Pacific Railroad and Counsel to the Receivers since the receivership, has recently resigned all connection, will be with the law department of the company and receivership. Some time ago Mr. McNaught was succeeded as General Counsel of Receivers by W. N. Cromwell, and he then removed his office back to St. Paul and has since been the legal representative of the Receivers in the Northwest. Mr. N. D. Bunn will now act as Counsel for the Receivers at St. Paul.

—Mr. R. B. Pegram, who has been Superintendent of the Memphis & Charleston Railroad, has been promoted to be General Superintendent of that company in charge of its operating department. Mr. C. H. Hudson, who continued to act as General Manager of the Memphis & Charleston after its separation from the East Tennessee, Virginia & Georgia Railroad, has removed to Washington to act as Chief Engineer of the Southern Railroad, and will, therefore, cease to act as General Manager of the Memphis & Charleston, and the office has been abolished.

—Mr. H. H. Browning, General Manager of the Northern Pacific Express Co., has resigned, although his resignation is not to take effect until June 1 next. It is understood that his duties will be performed by Mr. Thrall, the present Assistant General Manager, the two offices being practically consolidated. Mr. Browning has been for nearly 15 years with the Northern Pacific Express Co., being located first at Portland, Or., as Superintendent. He has been General Manager for the last six years and has managed the company's affairs with much enterprise and success.

—Mr. J. S. Leeds has been appointed Traffic Manager of the Business Men's League of St. Louis. His term is for three years, beginning May 15, and it is understood that he is to have an annual salary of \$10,000. Mr. Leeds, it will be remembered, was recently Traffic Manager of the Traffic Association of San Francisco, resigning that office only a few months ago. Mr. Leeds was formerly located at St. Louis, being for several years Freight Traffic Manager of the Missouri Pacific Railroad, with headquarters at that city. He was also for a time Commissioner of the Transcontinental Association.

—Mr. Joseph Crawford, Superintendent of the New York Division of the Pennsylvania Railroad with headquarters at Jersey City, was last week removed to a private asylum at Morris Plains, N. J. Mr. Crawford though attending to his duties as Superintendent at Jersey City for the last year or so has been in very poor health

from the results of the injuries which he received during the construction of the new train shed at Jersey City. It will be remembered he was struck by a heavy girder while standing on a platform supervising some detail of erection, his leg being fractured. He was compelled to give up all business matters for nearly two years, but in 1891 again assumed his duties, and it was then thought that he would very soon recover his former robustness.

—Judge N. E. Stedman has recently been nominated by Governor Culberson, of Texas, to be State Railroad Commissioner, succeeding Hon. L. L. Foster, who has been a member of the commission since its organization. Judge Stedman is a leading lawyer of Fort Worth, where he has been practicing for over 20 years, although now but 41 years of age. He has been District Attorney in Texas and Judge of one of the district courts. He has at various times represented a number of the chief Texas railroads as attorney and counsel, but he has also often had important cases against railroad companies. Judge Stedman was one of the influential advocates of the establishment of the railroad commission and was asked to accept the office of Commissioner soon after the inauguration of the present Governor, but he declined to accept the nomination until a few days ago, when he yielded to the repeated urging of the Governor.

—Mr. James Rutter, a director of the Louisville & Nashville Railroad and a well-known contracting engineer before his retirement from business, nearly 20 years ago, died in New York City on May 3 last. Mr. Rutter had acquired a large fortune, chiefly in railroad contracting, and in recent years had given his attention to investing his capital and serving as director in many financial and other institutions, among those being the Farmers' Loan & Trust Co., the Consolidated Gas Co., of New York, and several banks. Early in life he took up civil engineering, although without the advantage of a college education. After a time he engaged in railroad contracting and built important tunnels at the cities of Pittsburgh and Baltimore, as well as the Allegheny tunnel, which has done away with the necessity for the use of the inclined planes over the Allegheny Mountains which were used by the Pennsylvania Railroad when first opened.

—Mr. C. A. Goodnow, who has been Division Superintendent of the Chicago, Milwaukee & St. Paul since 1888, in charge of the Chicago & Council Bluffs Division in Iowa, has recently been appointed Assistant General Superintendent of the Southern District of that company. Mr. Goodnow is about 40 years old and is an exceptionally intelligent and alert operating officer. He is a New Englander by birth and his early railroad experience was on the Troy & Greenfield and Fitchburg railroads. He did not go West until 1886. For several years before that date he was Superintendent of the New Haven & Northampton Railroad, now a part of the New York, New Haven & Hartford, but in 1886 he became Superintendent of Construction on the Chicago, Milwaukee & St. Paul, holding that office until two years later when he was made Division Superintendent.

—General John Newton, U. S. A. (retired), President of the Panama Railway Co., the Panama Steamship Co., and the Columbian Steamship Line, died in New York City May 1. General Newton was a man who deserved well of his country and of his profession, and had secured to a large degree the just rewards of a useful life. He was distinguished as a soldier, as an engineer and as a citizen. Before the war he had accomplished much good military engineering work. During the war he served as an engineer officer, and also in command of troops, rising to the rank of Major General of Volunteers. He commanded a division, and at Gettysburg, after the death in the field of the gallant Reynolds, he succeeded to the command of the First Corps, which he held through the battles of July 2 and 3. As a commander of a brigade and a division he took part in many of the great battles of the war. After the war he had charge of a great variety of river and harbor work, and got especial credit for the removal of the obstructions at Hell Gate in the East River. He was retired in 1886 after 48 years' service. He served for a time as Commissioner of Public Works in New York City under Mayor Grace and also under Mayor Hewitt, and his administration was able and, as a matter of course, absolutely upright. General Newton was born at Norfolk, Va., August 24, 1823, graduated at West Point in 1842 and entered the Corps of Engineers at once, and was an officer of the Corps throughout his whole career, reaching the rank of Brigadier-General and Chief of Engineers. He was an Honorary Member of the American Society of Civil Engineers, and a member of the Century Club, the Manhattan Club and the Catholic Club.

ELECTIONS AND APPOINTMENTS.

Chicago, Milwaukee & St. Paul.—C. A. Goodnow has been appointed Assistant General Superintendent of the Southern District. Superintendent J. F. Gibson has been transferred from the Kansas City to the Chicago and Council Bluffs Division, in Iowa, and Superintendent E. D. Wright transferred from the Racine and Southwestern to the Kansas City Division. The jurisdiction of Superintendent J. B. Cable has been extended to cover the Racine and Southwestern Division.

Cumberland Valley.—The office of Road Foreman of Engines has just been created by this company, and Luther Cameron, an engineman, has been appointed to the office.

Eastern (N. H.).—At the annual meeting of the stockholders the following directors were elected: Moody Currier, Edward L. Giddings, Dexter Richards, Edward A. Abbott, William H. Goodwin, Frank A. Philbrick and Samuel C. Eastman. The directors elected Moody Currier President, Edward A. Abbott Treasurer and John Sise Clerk.

Grand Trunk.—The Shareholders' Committee, which controls a majority of the proxies, nominated the following committee to reorganize the company's affairs at the stockholders' adjourned meeting in London on May 7: Sir Charles Rivers Wilson, Lord Welby, Sir William Young, Colonel Firebrace, Sir Henry Mather Jackson and Messrs. Price, Smithers, Chauvin, Hubbard, Clutton-Brock and Allen.

Jacksonville, St. Augustine & Halifax River.—Henry M. Flagler, President; J. R. Parrott, Vice-President; J. C. Salter, Secretary, and S. W. Crichtlow, Treasurer; H. M. Flagler, Harry Harkness Flagler, Dr. Andrew Anderson, James E. Ingraham and J. R. Parrott, Directors, are the officers elected at the recent annual meeting.

Lehigh & New England.—The stockholders of this recently reorganized railroad, formerly the old Pennsylvania, Poughkeepsie & Boston Railroad, held their annual meeting May 6, and re-elected the old board of officers, and ratified the actions of the board in the reorganization matters. The officers elected were as follows: President, William Jay Turner; Directors, William B. Scott, Joseph F. Sinnott, W. W. Gibbs, W. W. Kurtz, J. W. Moffley and S. Pfaltz.

Michigan Central.—The annual meeting of the Railroad Company was held at Detroit, Mich., last week. The only business transacted was the election of the following Board of Directors: Cornelius Vanderbilt, New York; Frederick W. Vanderbilt, New York; William K. Vanderbilt, New York; Samuel F. Barger, New York; Edwin C. Worcester, New York; Chauncey M. Depew, New York; Henry B. Ledyard, Detroit; Ashley Pond, Detroit; Frederick S. Winston, Chicago.

Mexican Central.—The board of directors of the company, elected at the annual meeting of the stockholders at Boston last week, has organized by the election of these officers: President, A. A. Robinson; Vice-President, R. R. Symon; Clerk and Comptroller, J. T. Harmer; Treasurer and Transfer Agent, C. A. Browne; General Manager, H. R. Nickerson; Assistant Treasurer, J. A. Hendry; Auditor, W. A. Frost.

New Orleans & Northwestern.—The new directors have organized by electing the following officers: President, Charles Hyde; Vice-President, F. Del Hyde; Second Vice-President, J. H. Bethune; Secretary, James W. Lambert; Treasurer, J. M. Barkley, of Natchez, Miss.

New York, Lake Erie & Western.—John King having resigned as Receiver of the company, E. B. Thomas has been appointed Receiver in his place by an order of the United States Circuit Court, dated April 26, 1895. He is joint Receiver with John McCullough.

Theodore F. Powell, contracting Freight Agent of the road in Buffalo, has been promoted to be agent of the Erie Despatch, Commercial Express, and Inter-State Despatch, fast freight lines, with headquarters in Rochester, N. Y., to succeed George A. Bowman, who has been promoted to be Division Freight Agent.

An item announcing the recent changes in the titles of the Assistant General Freight Agent and other minor changes in the organization of the Freight Department was published in this column last week, page 287, but the item by inadvertence appeared under the heading of Lake Erie & Western.

Norfolk & Western.—The annual meetings of the stockholders of the Norfolk & Western Railroad and subsidiary corporations were held in Roanoke, Va., on May 1. F. J. Kimball was re-elected president of all of the most important of them, and he was also re-elected President of the Norfolk & Western. The Norfolk & Western Board of Directors for the next year was elected as follows: F. J. Kimball, Joseph I. Doran, Richard S. Brock, Samuel A. Crozier, A. J. Dull, U. L. Boyce, Walter H. Taylor, Henry Whelan, Harry F. West, H. S. Trout, Harold M. Sill, William B. Campbell and Clarence H. Clarke.

Northern Pacific.—The office of Assistant Superintendent of the Pacific Division has been abolished, and Mr. G. F. Wentworth, who has held that office, is to be transferred to another position.

Quincy, Omaha & Kansas City.—At the annual meeting of stockholders last week the following Directors were elected: Messrs. John Paton and Edward Parsons, of New York; W. W. Jacobs, Hartford, Conn.; George Hall, Trenton, Mo.; F. M. Harrington, Kirksville, Mo.; R. Balthrope, Edina, Mo., and C. H. Bull, H. F. J. Ricker, J. D. Morgan and Amos Green, of Quincy, Mo.

Rochester & Southern.—The following are the directors of this company, organized to build a branch of the Lehigh Valley: Elisha P. Wilbur, Robert R. Sayre, of South Bethlehem, Pa.; Charles Hartshorne, John S. Garrett, Henry S. Drinker, James F. Schaperkotter, of Philadelphia; Wilson S. Bissell, of Buffalo; Joseph W. Taylor, of Rochester, and Alexander M. Holuen, of Honeoye Falls. Elisha P. Wilbur subscribed for 4,980 of the 5,000 shares of the capital stock of the company.

Unadilla Valley.—At a meeting of the stockholders on May 1, the following directors were elected: Frederick Decoppet, Ralph Brandreth, Frederic F. Culver, Benjamin W. Appleton, Clarence Goadby, William L. Skidmore and William Thorne. The directors subsequently elected the following officers: President, Frederick Decoppet; Vice President, Ralph Brandreth; General Manager, Frederic F. Culver; Treasurer, Benjamin W. Appleton; Secretary, Clarence Goadby; Superintendent, Charles N. Chevalier; General Freight and Passenger Agent, Benjamin W. Appleton, and Auditor, August G. af.

Wilmington & Northern.—The eighteenth annual meeting of the stockholders of the railroad was held at Birdsboro, N. J., on May 6. The following officers were elected: President, H. A. DuPont; Directors, George Brooks, Dr. Charles Huston, A. L. Foster, John S. Gerhard, Col. L. Heber Smith, William S. Conner; Secretary, E. B. Shurter; Superintendent and Treasurer, A. G. McCausland; Chief Engineer, F. L. Hills; General Freight and Passenger Agent, Bowness Briggs.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Addison & Pickens.—General Manager Kunst, of the West Virginia Central & Pittsburgh, states that work will begin this month on the extension of the line from the present terminus at Pickens to Addison, Webster County, W. Va. The line has been surveyed and the engineers are now taking the final location preparatory to beginning work. Webster County has voted \$50,000 to the new line, which will be known as the Pickens & Addison Railroad, although it is practically an extension of the West Virginia & Pittsburgh, about 66 miles long. The territory traversed is wild and heavily wooded with a d woods, and the surface is underlaid with good coal, while at the terminus is the Webster springs.

Alameda & San Joaquin Valley.—John Treadwell, Robert D. Fry, E. B. Pond, J. Dalzell Brown and Brodie M. Bradford have filed articles of incorporation under this title in California. The corporation has been organized to build a line 30 miles in length from the coal mines of the San Francisco & San Joaquin Coal Co. to the San Joaquin River near the dividing line between San Joaquin and Contra Costa counties.

Atlantic & Lake Superior.—Mr. C. N. Armstrong, projector of this scheme for a railroad from Pasbebiac, Que., on the Baie des Chaleurs, to Sault Ste. Marie, Ont., has returned from England, and states that arrangements have been made to secure the funds necessary to complete the 20 miles of the Baie des Chaleurs Railway and 80 miles of the Great Eastern Railway.

California, Oregon & Idaho.—This company filed articles of incorporation at Salem, Cal., to build a road from a point in Solano County, Ore., across Oregon and through Southern Idaho. The incorporators are: J. M. Bassett, Oakland, Cal.; L. W. Brown, Eugene, Ore.; Robert Clow, Junction City, Ore.

Charleston, Clendennin & Sutton.—Last week an inspection party, composed of Gov. W. A. MacCorkle, of West Virginia, Isaac V. Johnson, State Auditor; D. C.

Gallagher, E. B. Knight, Judge A. F. Guthrie, J. J. Carnes, W. K. Fortune, Neil Robinson, A. J. Kelley and others financially interested in the railroad, made a trip over the line from Charleston to a point within five miles of Clay Court House, to which point the road is completed and in use by construction trains. Upon his return Governor MacCorkle said the work was progressing very satisfactorily and that within the year trains will be running from Charleston to Sutton, at which point a connection is made with the West Virginia & Pittsburgh, and through it with the Baltimore & Ohio. He also stated that at the last meeting of the directors it was positively decided to continue the road from Sutton through Webster and Braxton counties and into Randolph, where it will connect with the West Virginia Central & Pittsburgh. The Governor says the road is building throughout with heavy ties, stone ballast and 72-lb. steel rails.

Chicago, Indiana & Eastern.—The work of building the road east from Mathews, Grant County, to Muncie, Ind., will now be pushed rapidly and a force of men will be at work upon the grade near Muncie soon. At a meeting of the board of directors it was decided to build to Muncie instead of to Redkey, and make Muncie a terminal station.

Choctaw, Oklahoma & Gulf.—Judge Scott, of the Oklahoma Territorial Court, has dissolved the injunction granted against the railway to prevent it from building through the Kickapoo reservation, and holds that the Secretary of the Interior had no power to interfere in the construction of the road. The road being built is the 90-mile connecting line between the Eastern and Western divisions now in operation. The grading was being done on a new location, adopted since the first surveys were accepted by the company's officers and the government authorities.

Elberton Air Line.—The stockholders have formally voted to authorize a change of gage on this line from 3 ft. to standard. The road is now operated by the Southern Railway, but the independent organization of the branch line has been kept up. It operates about 50 miles of line, giving the Southern Railway a connection with the town of Elberton in northeastern Georgia. It leaves the main line at Toccoa, about 95 miles north of Atlanta, Ga.

Hinton & New River.—At an election held in Summers County, W. Va., it was decided to issue \$30,000 bonds for stock of this railroad, to be built from the Chesapeake & Ohio Railroad, by way of New River, to the Norfolk & Western at Glen Lynn. The company is making progress toward securing the necessary funds for the work and hopes to succeed in letting the work to contract before fall.

Leroy & Northern.—This company was incorporated in New York last week to operate a steam or electric road in Genesee County. C. F. Prentice, D. C. H. Prentice, N. B. Keeney and C. N. Keeney, of Leroy, N. Y., are the directors. The line will connect the Le Roy Salt Works and other local factories and the Woodruff stone quarry with the Buffalo, Rochester & Pittsburgh, the New York, Lake Erie & Western and the New York Central roads. This will facilitate the delivery of the blue limestone from the quarry. Electric derricks will be used to swing the stone to the cars ready for shipment. The survey is now completed and three-fourths of the right of way secured. Grading will be begun next week.

Monterey Mineral & Belt.—This railroad at Monterey, Mex., has been completed, and will be placed in operation this week. It connects the smelters of Monterey with the rich mining district near that town, and is about 15 miles long altogether. One mining company has 12,000 tons of ore ready to be shipped by the new line. William Johnston, President of the Johnston Steamship Company, is the President of the road, and C. K. Lord, Vice-President of the Baltimore & Ohio road, and J. A. Robertson, General Manager of the Monterey & Mexican Gulf Railroad, are directors of the road, which was built under the direction of Mr. Robertson.

National Tehuantepec.—The Mexican Congress has been asked to approve a contract between the Mexican Government and Samuel Bros., of New York, for the supply of \$2,000,000 worth of rolling stock, bridges, machinery for shops, etc., for the Tehuantepec railroad bridges, tugs and lighters for the harbors and steamships for lighthouse purposes. Messrs. Samuel Bros. are also negotiating for the construction of the harbors of Coatzacoalcas and Salina Cruz respectively the Atlantic and Pacific terminals of the Tehuantepec road.

New Brunswick, N. J.—The Pennsylvania Railroad seems to have been defeated in its effort to construct a continuous bridge across the Raritan Canal at this town in place of the existing drawbridge. The new bridge is to be part of the improvements for the present line through New Brunswick proposed by the Pennsylvania, but the local authorities opposed the plan for doing away with the drawbridge on the ground that it would interfere with the navigation of the canal above New Brunswick, and so affect the value of the city water front. The dispute has been a very long one, and the matter was finally carried to the Secretary of War by the city authorities. It seems that the question instead of being decided by the Chief of Engineers was referred to the Attorney-General, and he has now given an opinion that the construction of the new bridge, according to the present plans of the Pennsylvania, ought not to be authorized by the government.

New Jersey & New York.—This company is now extending its second track from Cherry Hill, N. J., to Oradell, N. J., a distance of about three miles. The work has not been contracted for, but the grading and track-laying is now being performed by the company, under the direction of J. D. Hasbrouck, General Manager. There are no trestles or bridges on this work.

New Roads.—At a meeting of the County Court of Pendleton County, W. Va., held at Franklin last week, an ordinance was passed submitting to the people of the county, at a special election to be held June 1, 1895, a proposition to issue \$40,000 of the county bonds, to be given outright to any responsible company or individual who will build a railroad across the country by way of the South Branch Valley, passing through Franklin, the county seat. The County Court will also give the right of way and also guarantee all ties, piles, bridge timbers, etc., at 50 per cent. less than the market price. There is no doubt of the subscription carrying, as the County Court has been petitioned for the privilege by over one-half the voters in the county. The road suggested is estimated to be about 40 miles long. It would pass through a fine agricultural and grazing region and open up coal and timber lands and large bodies of tan bark.

Petersburg.—The new branch line around the city of Petersburg, Va., has just been opened for traffic as already stated. This new line, often referred to as the

Petersburg Belt, leaves the Richmond & Petersburg railroad immediately south of where the railroad crosses Swift creek and joins the Petersburg Railroad near Acree, about three miles south of the center of the city of Petersburg. It is six miles in length. Work was commenced July, 1894. The construction involved an iron bridge over the Appomattox River, 1,300 ft. long and 85 ft. high. The track was laid on trestles which are now being filled with a steam shovel. The maximum curvature is 2 degrees. In addition to the bridge over the Appomattox bridge there is an iron bridge over the Appomattox canal and four others over the several roads coming into Petersburg. The work was done under the personal supervision of H. Walters, President of the Atlantic Coast Line, with Mr. R. I. Latta, as Resident Engineer.

Rochester & Southern.—This company was incorporated in New York this week with a capital of \$500,000 to build a steam road from the village of Honeoye Falls, Monroe County, to Hemlock Lake, Livingston County, a distance of 14 miles. The directors are Elisha P. Wilbur, Robert H. Sayre, of South Bethlehem, Pa.; Charles Hartshorne, John B. Garrett, Henry S. Drinker, of Philadelphia, and others connected with the Lehigh Valley. The road will be built as a branch of the Buffalo division of the Lehigh Valley from a point on the line east of Rochester.

Santa Fe, Prescott & Phoenix.—A party of surveyors employed by this company have started out from Phoenix, Ariz., eastward, locating the line to Nogales, on the Mexican line, by the way of Florence, Tucson and the Santa Cruz Valley. It is understood that contracts have already been placed for the bridges across the Salt and Gila rivers. The extension will be nearly 200 miles in length, but is across a level region.

San Francisco & San Joaquin Valley.—The preliminary survey for the line south of Stockton, Cal., begun some weeks ago, has now been finished for about 25 miles. The terminal points of the road are to be San Francisco and a point in Kern County, near Bakersfield. So far only preliminary work has been done, but the general route from Stockton to Bakersfield, a distance of 250 miles, is practically determined upon within limits of 15 miles laterally. It is probable that some contracts for grading will be let within the next 90 days. The work from Stockton to Bakersfield will be valley work, the greatest items of expense being river crossings, these rivers cutting the route traversed transversely and occurring every 15 or 25 miles. The route from San Francisco to Stockton, or to a junction of a line from Stockton to Bakersfield, has not been determined upon and will not be for some months, until detailed surveys and estimates of cost can be made. W. B. Storey, Jr., of San Francisco, is Chief Engineer of the road.

Sebasticook & Moohead.—The proposed extension of the railroad from Hartland, Me., to Guilford via St. Albans, West Ripley and Cambridge, is now being surveyed. The route is a very easy one and the building of the extension is assured if the towns secure the right of way.

Shreveport & Texas.—This company was organized at Shreveport, La., with J. T. Craddock, of Greenville, Tex., President; H. H. Youree, of Shreveport, Vice-President; W. E. Hamilton, L. M. Carter, Bryan Ardis and S. B. Hicks, of Shreveport, and E. M. Smith of Cleveland, O., directors. The company is organized to carry out an agreement between the citizens of Shreveport and the Missouri, Kansas & Texas, which is to extend its line, the Sherman, Shreveport & Southern, via Waskom, Tex., into Shreveport.

Tennessee Central.—Col. Jere Baxter, of Nashville, President of this railroad, now building, has just gone over the route in company with Mr. C. H. Inman, a New York banker, to look over the work already finished along the line, and the prospects for the development of the coal and timber resources. The rails for the line between Crossville and Monterey are being delivered and the track-laying will begin at once at Harriman. The first seven miles will be hurried, connecting Kingston and Margrave Camp with the Cincinnati Southern at Emory Gap. Mr. Cabell Breckinridge is now Resident Engineer of the road. He was Assistant Engineer in the construction of the Cincinnati Southern.

Tunnelton, Kingwood & Fairchance.—The work of changing this line to standard gage is progressing as rapidly as possible without interfering with traffic. The cuts and tunnels are being widened and the road bed prepared for the new ties. The new rails are being put down on the Kingwood end of the line, and the work will be completed within three months. The control of the property was recently transferred and George C. Sturgiss, of Morgantown, W. Va., is President, and J. Auri Martin, of Kingwood, W. Va., Secretary and General Manager. It is 20 miles in length, extending from Tunnelton, on the Baltimore & Ohio, to Kingwood. The new company, when the old local concern was bought out, pledged itself, as a part of the sale contract, to extend the line within two years to Morgantown, W. Va., and to make it standard gage throughout. The right of way has been secured to Morgantown, and the road will follow an old survey all the way. President Sturgiss, speaking of the road's prospects this week, said it would also be extended from Kingwood to Fairchance, Pa., along the route surveyed several years ago when the road was first built. This work will not be taken up, however, this year. Even as a narrow gage the road has developed a large lumber trade through Preston County, and since the work of broadening it began several large tracts of coal have been bought by parties who will open it as soon as the transportation facilities are provided. The name of the road is to be changed to the West Virginia & Northern. Contracts have been placed for new engines with the Baldwin Locomotive Works of Philadelphia.

GENERAL RAILROAD NEWS.

Atlanta & Florida.—The sale of the railway, which was to have taken place at Atlanta, on April 29, has been postponed by order of Judge Newman, of the Federal Court in Atlanta, until June 3.

Cedar Falls & Minnesota.—At the recent annual meeting of the stockholders of this company, one of the leased lines of the Illinois Central, a change was made in the officers, the President, J. Kennedy Tod, of New York, who has held that office for some time, being succeeded by W. J. Knight, an officer of the Illinois Central. The representatives of the Illinois Central voted something like 7,500 shares at the annual meeting, President Tod's representatives having control of about 3,500 shares. The stock is of nominal value, and its purchase by the Illinois Central was brought about by the contest between that company as lessee and the bondholders of the railroad. The Illinois Central some years ago asked

for a change in the terms of the lease, which was opposed by the bondholders, and their position was sustained in a contest before the courts. The question is now before the Supreme Court at Washington on appeal.

Cincinnati Southern.—The Southern Railway and the Cincinnati, Hamilton & Dayton interests have settled all differences as to the Cincinnati extension bonds of the East Tennessee, Virginia & Georgia, and the properties underlying them on a basis entirely satisfactory to both parties. Under the terms of the settlement the Cincinnati, Hamilton & Dayton interests retire entirely from the Alabama Great Southern, the Southern Railway having acquired their entire holdings. The control in capital stock of the Cincinnati, New Orleans & Texas Pacific is to be owned and held equally and jointly by the Southern and Cincinnati, Hamilton & Dayton interests.

Cleveland, Canton & Southern.—The Knickerbocker Trust Co., of New York, has begun foreclosure proceedings in the United States Court at Cleveland against the railroad company. The trust company holds part of the issue of \$10,000,000 issue of first consolidated mortgage bonds, on which interest payments were defaulted in May, 1893.

Eastern (New Hampshire).—At the annual meeting of the stockholders of the Eastern Railroad in New Hampshire this week, the matter of consolidation with the Boston & Maine Railroad was referred to the same committee selected last year to consider the subject.

Georgia Southern & Florida.—Judge Gregg, of the Georgia State court, has just ratified the sale of the railroad. The property was bought April 2 by a committee of the bondholders. All obstacles to the reorganization of the property are removed by the confirmation of the sale. The reorganization committee now has the support of all the bondholders.

Grand Trunk.—The adjourned meeting of the shareholders was held in London, on May 7. At that meeting the Chairman of the Shareholders' Committee, which had secured enough support from the stockholders to overturn the former management, named its candidates for directors to succeed the former board and reorganize the company. The names of these are given in another column. The Chairman of that committee proposed a resolution increasing the remuneration of the directors to the sum of £7,500 a year. The increase was to enable the directors to give a larger salary to the new President, Sir Charles Rivers Wilson, who is to receive £4,000 a year. He also received £1,500 for expenditures incurred in furthering the reorganization scheme. The stockholders also voted to give the directors authority to issue new debenture bonds if such issue became necessary.

New York, Lake Erie & Western.—The earnings for March and for the half-year are reported in the following table:

Month of March:	1895.	1894.	Differences.
Gross earn.	\$2,190,579	\$2,070,240	I. \$120,339
Working exp.	1,547,663	1,492,690	I. 54,973
	\$651,916	\$577,551	I. \$74,365
Less proportions due to leased lines	\$306,236	\$183,578	I. \$122,658
Net earn.	\$345,679	\$393,973	I. \$48,294
Results of operation of auxiliary companies (Def.)	\$45,346 (Def.)	\$73,376 (Def.)	D. \$28,030
Net results of the system.	\$400,332	\$280,587	I. \$119,745
Oct. to March 31:	1894-5.	1893-4.	Differences.
Gross earn.	\$12,583,322	\$12,912,250	D. \$328,928
Working exp.	9,215,812	9,305,151	D. 89,339
	\$3,367,510	\$3,607,099	D. \$239,589
Less proportions due to leased lines	\$1,169,453	\$1,153,431	I. \$16,022
Net earn.	\$2,198,056	\$2,453,668	D. \$255,612
Results of operation of auxiliary companies (Def.)	\$312,183 (Def.)	\$219,103 (Def.)	I. \$93,080
Net results of the system.	\$1,885,873	\$2,234,564	D. \$348,691

The gross earnings include, for both years, the income from other sources, with the exception of interest on securities, and the working expenses include the deductions from income with the exception of the fixed charges and the state taxes.

New York & New England.—Judge Wallace, in the United States Circuit Court, has handed down a decree directing a sale of the railroad by foreclosure of the second mortgage for \$5,000,000, the last two coupons of which are in default. The sale will take place at Hartford at a date to be fixed by a master. The proposed sale is but a formality in the re-organization of the company, and it is expected to be bought in by the re-organization committee for the account of the newly organized New England & New York Railroad. The Rhode Island Legislature has not yet passed the bill authorizing the acquisition of the property by the new company, but the company owns only a few miles in that state.

Rio Grande Western.—The statement of earnings for March shows:

Gross earn.	\$166,602	I. \$17,974
Operating exp.	112,494	I. 311
Net earn.	\$54,107	I. \$17,662
For nine months:		
Gross earn.	\$1,592,481	I. \$28,297
Operating exp.	1,068,157	I. 60,212
Net earn.	\$524,324	D. \$31,915

The increase of 50 per cent in the net earnings for March was principally derived from the larger traffic in coal and coke and California fruits, with moderate gains from miscellaneous freights.

Oregon Short Line & Utah Northern.—The suit of the American Loan & Trust Co., of Boston, for the appointment of an independent receiver of this line to separate its operations from those of the Union Pacific, came up before Judge Sanborn in the United States Circuit Court at St. Paul on May 1. This was in accordance with the recent order of Judge Gilbert of the Oregon Circuit Court, on the same petition which was argued before him at great length last month. It will be remembered that by his opinion the whole question as to the necessity or desirability of appointing a separate receiver for the Oregon Short Line was referred to Judge Sanborn, who sits for the Wyoming Circuit, the Court having original jurisdiction in the receivership case. The original appointment of the receivers having been made in that jurisdiction, Judge Gilbert did not make a final order in the suit of the bondholders, represented by the Trust Company for the appointment of an independent

receiver. However, he appointed John M. Egan to that office with the stipulation that he should not assume control of the Oregon Short Line until the suit was argued before Judge Sanborn and a decree announced by him. The Trust Company which asked for an appointment of a separate receiver is trustee of the consolidated mortgage, amounting to \$10,000,000. The Union Pacific Receivers who are now operating the railroad were appointed in the suit begun in 1893 under what is known as the Dillon mortgage.

Southern.—The earnings and expenses of the system for the month of March, 1895, and for nine months from July 1, 1894, compared with the same period for the year 1893, are given in the following tables:

Month of March:	1895.	1894.	Inc. or Dec.
Gross earn.	\$1,503,117	\$1,562,470	D. \$59,353
Expen. and taxes.	1,049,269	1,145,631	D. 96,362
Net earn.	\$453,848	\$416,839	I. \$37,009
Per cent. exp. to earn.	69.8	73.3	
Nine mos. to Mar. 31, 1895:			
Gross earn.	\$13,002,012	\$12,738,132	I. \$263,879
Expen. and taxes.	8,666,897	8,873,019	D. 206,121
Net earn.	\$4,335,114	\$3,865,114	I. \$470,000
Per cent. exp. to earn.	66.2	69.7	

TRAFFIC.

Traffic Notes.

Wells, Fargo & Co. announce that they will retire from the business of carrying letters, in the United States; but in Mexico the service will be continued. This announcement marks the passing away of one of the peculiar phases of early Western civilization, the carrying of letters by express having been begun by Wells, Fargo & Co. in California before the Government established a sufficient and reliable mail service.

The newest wrinkle in dining cars is to be found on the Chicago & Eastern Illinois, where, according to a Western paper, the passenger who dines on the train now has his attention drawn away from the high prices on the bill of fare by music from a Swiss music box. Each box has three cylinders and each cylinder plays eight tunes.

The Great Northern has reduced the time of its through trains between St. Paul and the Pacific Coast about eight hours.

The Port Royal & Western Carolina, which is in the hands of Receiver J. B. Cleveland, refused to join in the boycott against the Seaboard Air Line. When the order of the Commissioner of the Southern Railway and Steamship Association was issued to the several roads, members of the association, requiring them to exact full local rates of freight from the Seaboard Air Line, Mr. Cleveland took the position that he could not legally obey the order of the Commissioner, and has since refused to do so. Recently he received a letter from the Commissioner stating that complaint will be filed against him for his failure to obey the order issued by the Commissioner. As soon as he received this letter Receiver Cleveland, accompanied by his counsel, went before Judge Simonton, of the United States Circuit Court, and presented a petition setting forth all the facts, and asked the advice and instructions of the Court in the premises. Judge Simonton has now approved the course of the Receiver, and directed him to continue in his present course of conduct.

George A. Bowman, who has recently been made Division Freight Agent of the New York, Lake Erie & Western, has been succeeded by Theodore F. Powell as Agent of the Erie Dispatch, the Commercial Express and the Interstate Dispatch Fast Freight Line with headquarters at Rochester, N. Y. He was recently Contracting Freight Agent of the railroad at Buffalo, N. Y.

The Northern Pacific Steamship Co., has secured three new steel steamships to run between Tacoma and Hong Kong. The steamship Sikh, now running, is to be taken off, leaving the Victoria and Tacoma still on. These, with the new vessels, Evandale, Strathnevis and Hankow, make a fleet of five. The Evandale and the Strathnevis were both built this year in Great Britain, and the Hankow is only a few years old. The Victoria can carry about 3,000 tons, the Tacoma 2,500 and the new vessels about 5,500 tons each.

Interstate Commerce Commission Hearings.

Members at the Interstate Commerce Commission held hearings at Omaha and Kansas City last week and this week have been holding a session at Chicago, hearing various complaints. Among the cases being considered are: Complaint of George Castle, of Chicago, against the Baltimore & Ohio, alleging discrimination on shipments of sand; complaint of the Fruit Growers' Association of Illinois against the Illinois Central for discrimination in raising the rate on fruit and vegetables shipped in refrigerator cars from certain stations in Illinois, while other roads from the same territory have not thus raised the rates. Two cases continued from the hearing at Denver will also be concluded at Chicago; complaint of George Kendall, of Denver, that rates in and out of Denver are unfair when compared with through rates by way of that city; complaint of the Colorado Fuel and Iron Company that the rate upon iron and steel rails from Denver to San Francisco is discriminative as compared with like service from Chicago to San Francisco.

National Transportation Association.

The annual meeting of this Association was held at Chicago, May 3. Delegates were present representing the following members of the Association: Chicago Board of Trade, Chicago Freight Bureau, Cincinnati Chamber of Commerce, Peoria Board of Trade, St. Louis Merchants' Exchange, Boston Chamber of Commerce, Louisville Board of Trade, Indianapolis Board of Trade, Millers' National Association of the United States, Baltimore Corn and Flour Exchange, Commercial Exchange of Philadelphia, Cleveland Chamber of Commerce, National Paint, Oil & Varnish Association, Milwaukee Board of Trade, Minneapolis Chamber of Commerce, Duluth Board of Trade, Detroit Board of Trade, Toledo Produce Exchange, Manufacturers' Club of Philadelphia, and the New York Board of Trade and Transportation.

Secretary Stone presented his annual report, which was adopted with complimentary resolutions. Resolutions were adopted endorsing the last annual report of the Interstate Commerce Commission, and calling upon Congress to enact amendments to the Interstate Commerce law which will make it effective. A free discussion was had regarding the desirability of urging the adoption of a uniform classification and uniform bill of lading, and it was the sense of the meeting that the association continue its efforts to bring about these desired changes. Discussion was also had on the subject of the refunding of overcharges when such overcharges are evident mistakes, without the formality of passing the bills through the claim departments. Various other matters were under discussion during the meeting, and several questions were referred to the executive committee for further consideration.

The following officers were elected for the ensuing

year: President, Frank Barry, Milwaukee; Vice-President, E. L. Rogers, Philadelphia; Treasurer, H. F. Langenberg, St. Louis; Secretary, Geo. F. Stone, Chicago. Claims Committee: Brooks, J. J. Telford, Louisville; W. S. Young, Baltimore. Promotion Committee: Messrs. Telford, Young, Ranlet and Stone. Interstate Commerce: E. P. Wilson, Cincinnati; D. W. Ranlet, Boston; R. S. Lyon, Chicago; R. C. Grier, Baltimore. Car Service: N. G. Iglehart, Chicago; H. E. Kinney, Indianapolis; W. S. Young, Baltimore. Uniform Classification: Messrs. Iglehart, Langenberg and Brooks. Executive Committee: Messrs. R. S. Lyon, M. A. Woolen, D. W. Ranlet, R. C. Grier and A. L. White-law.

Chicago Traffic Matters.

CHICAGO, May 8, 1895.

The indications are that the imminent agreement of the Western lines will be considerably strengthened by the action of the Trunk Line presidents in directing the stoppage of payment of excessive commissions by any of the lines or via any port after May 15, coupled with an understanding that all rates quoted by the Grand Trunk to points on and via Canadian Pacific are to be withdrawn until uniform rates can be agreed upon by association action. It seems that the Trunk lines did not exert themselves very much to relieve the situation so long as the fight was between the Grand Trunk and the Canadian Pacific, but when the North German Lloyd Steamship Company began offering commissions via Baltimore, the necessity for prompt action became at once apparent.

The refusal of the Chicago Lake lines to pro-rate with Western railroads on eastbound freight, while Lake Superior lines pro-rate on freight coming to them at Duluth and other Lake Superior ports, has forced the Chicago railroads to protect themselves, which they have done by making an agreement with the Wabash and the Clover Leaf to pro-rate on through lake and rail rates. The latter line made its assent to pro-rate conditional upon an advance of 2 cents per 100 lbs. on grain by lake and rail, which has been agreed to by the Western lines. This makes the rate 20 cents per 100 lbs. to New York, lake and rail, from Illinois junctions, as a proportionate rate on grain coming from west of the Mississippi.

The Atchison has made a rate of \$1 per 100 lbs. on oranges from California points to the Atlantic seaboard, a reduction of 25 cents, to meet competition on oranges from the Mediterranean.

Central Traffic Association lines have again declined to adopt the interchangeable mileage ticket.

Passenger men are still at work endeavoring to perfect their new Association agreement. It is reported that the co-operation of the Union Pacific has finally been secured, and that the chances for the formation of new associations both east and west of the Missouri are better than heretofore. The fact that the representative of the Chicago & Northwestern is actively engaged furthering the formation of a new Association substantiates this report.

The first definitely reported cut in eastbound rates since the new agreement went into effect (May 1) is that of the American Refrigerator Transportation Company, a cut of 20 cents per 100 lbs. on dairy freight eastbound from Kansas City via East St. Louis, the Wabash and the Erie. This cut has been met by a 15 cent reduction by the Merchants' Despatch, applicable to territory west of Chicago as far as Central Iowa points. Notwithstanding this "incident" the roads of the St. Louis East-bound Traffic Association last week solemnly agreed to strictly maintain all rates on the basis of the agreed tariffs on all business from St. Louis and East St. Louis, and at all gateways and junction points north of St. Louis controlled by the lines of the association.

The Chicago and Ohio River lines are again apparently on the verge of a rate war between Chicago and Cincinnati and Louisville, and it will take considerable diplomacy on the part of the chairman to prevent it.

Recent reports of passenger irregularities are confirmed by advices from Denver that all scalpers there have been supplied with return portions of excursion tickets issued by the Union Pacific, which are being sold at \$10, Denver to the Missouri River. It is also claimed, but not well authenticated, that the going portions of these tickets were manipulated, the story being that the Omaha scalpers purchased a block of these tickets from the Union Pacific for \$30, and by some arrangement exchanged the going portions for train checks, and then sent the return portions to their correspondents at Denver. The other lines have made an open rate of \$10 from Denver to the Missouri River, effective from May 7th to 19th inclusive, and threaten to extend the cut east of the Missouri River unless the objectionable tickets are taken out of the market.

The Texas freight rate situation is extremely critical and the Executive Committee has been called to meet at St. Louis next week.

Yesterday the grain men reported the lowest through rate on grain ever made from Chicago to New York. It is by lake to Buffalo and thence by the Erie Canal, 2½ cents a bushel on corn and 3 cents on wheat from Buffalo, including the transfer charges at Buffalo, which makes the through all water rate, Chicago to New York, 3½ cents on corn and 4 cents on wheat, equal to 6½ cents per 100 lbs.

The advance in lake rates to Buffalo last week was not maintained, and to-day the boats are accepting 1½ cents on corn.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines for the week ending May 4, amounted to 53,285 tons, against 61,408 tons during the preceding week, a decrease of 8,123 tons, and against 55,779 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	WEEK TO MAY 4.		WEEK TO APRIL 27.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central.....	3,062	5.7	9,483	15.4
Wabash.....	4,577	8.6	5,901	9.3
Lake Shore & Mich. South.	7,989	15.0	7,973	13.0
Pitts., Ft. Wayne & Chicago	10,625	19.9	12,065	19.5
Pitts., Cin., Chi. & St. Louis.	7,517	14.1	5,634	9.2
Baltimore & Ohio.....	1,967	3.7	2,356	3.8
Chicago & Grand Trunk....	1,964	3.7	3,712	6.1
New York, Chic. & St. Louis	5,690	10.7	6,008	9.8
Chicago & Erie.....	8,126	15.3	7,454	12.1
C., C. & St. Louis.....	1,763	3.3	1,672	2.8
Totals.....	53,285	100.0	61,408	100.0

Of the above shipments 3,072 tons were flour, 22,477 tons grain and mill stuff, 10,049 tons cured meats, 7,332 tons dressed beef, 1,170 tons butter, 800 tons hides, and 6,707 tons lumber. Lake lines carried 85,705 tons, nearly all grain.